January 15, 1945

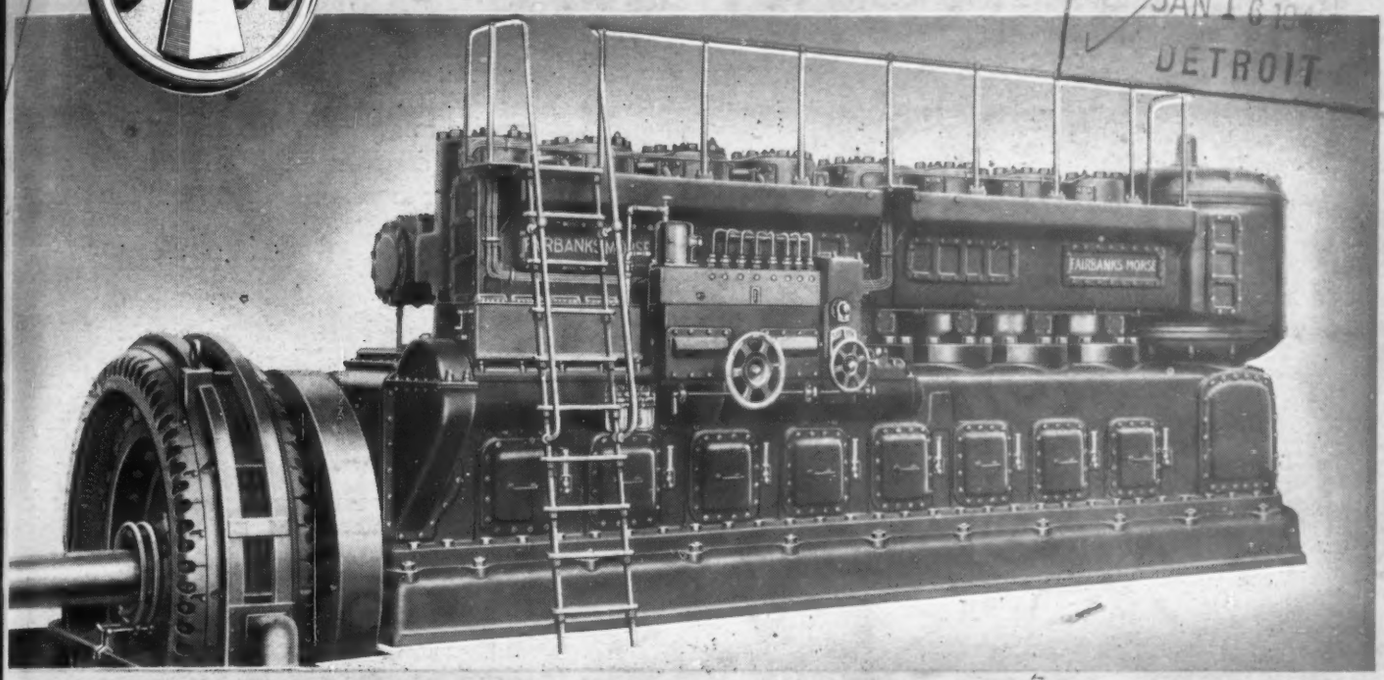
STEEL

The Magazine of Metalworking and Metalproducing

ESTABLISHED 1882

TECHNOLOGY DEPT.

Fairbanks-Morse Diesels for industry are known for their economy and year-in, year-out dependability. They may be the answer to your power problems, too.



A name worth remembering

Fairbanks-Morse

Diesel Locomotives • Diesel Engines • Generators
Motors • Pumps • Scales • Stokers • Magnetos • Railroad
Motor Cars, Standpipes • Farm Equipment

Buy More War Bonds

Diesels

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[PUMP TIPS FROM ALLIS-CHALMERS—ONE IN A SERIES]

How to make SHAFTS Last Longer . . .

The Allis-Chalmers "Electrifugal" Pump is a unit-designed pump . . . with both impeller and motor mounted on one shaft and in one frame. The next time you need new pumps . . . look into the extra efficiency, ruggedness and long life of Allis-Chalmers centrifugal pumps . . . the "Electrifugal" . . . and all types for every purpose.

WHERE YOU HAVE an Allis-Chalmers "Electrifugal" Pump . . . shaft and rotor pictured at left . . . you don't have an alignment problem—because *both* impeller and rotor are mounted on *one* shaft.

However, many pumps in use today are coupled to a separate motor, and how well the two are aligned has a lot to do with how long the shaft lasts . . . and the pump and coupling too . . . because misalignment starts all three fighting each other!

Here are a few tips which will help you get longer life out of pump shafts:

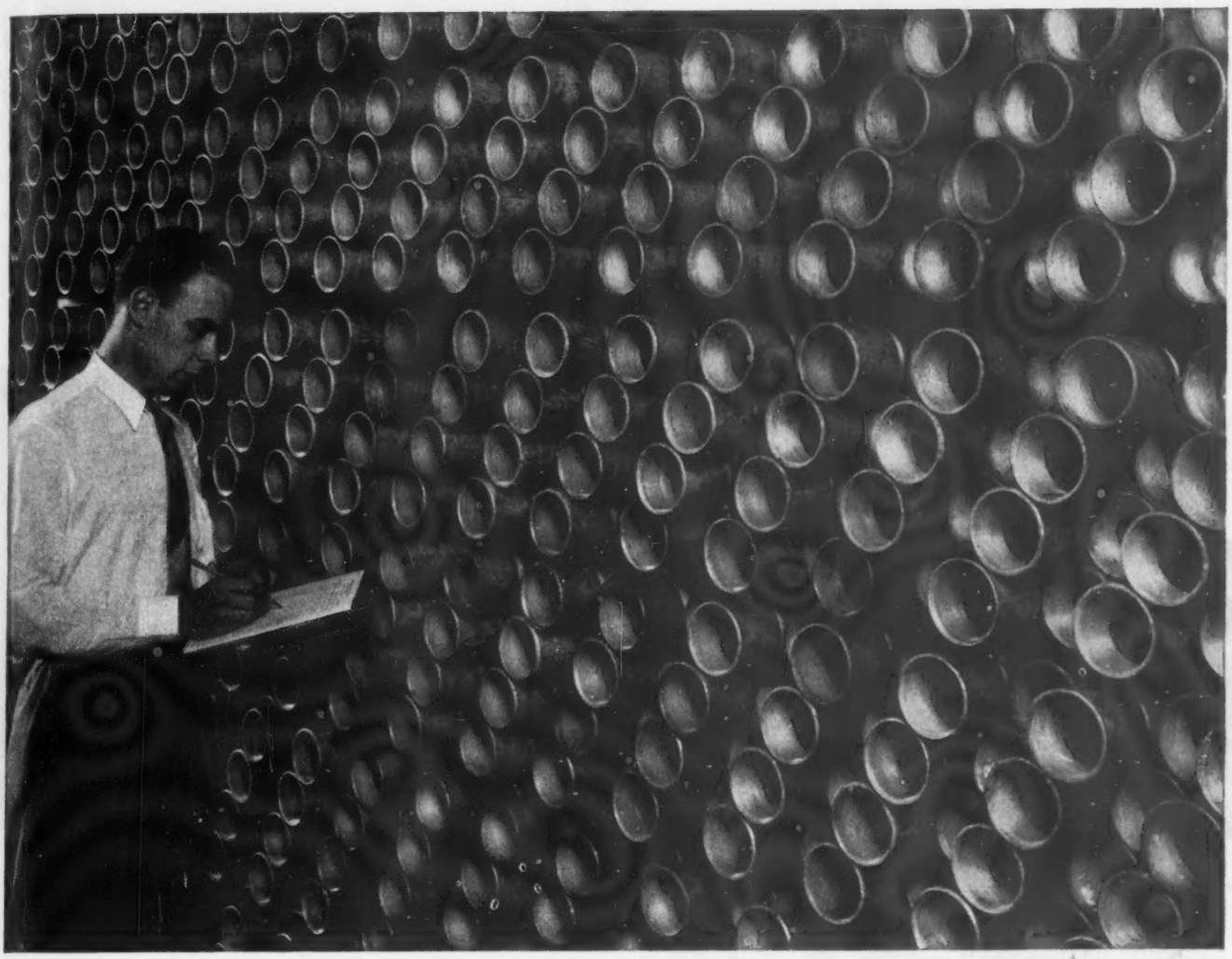
- See that pump and motor coupling flanges are parallel . . . both vertically and axially . . . and that they are kept that way!
- If misalignment recurs frequently, check foundations, piping, bolted connections.
- In the case of boiler feed or other pumps which reach high operating temperatures, be sure that alignment of motor and pump is checked after *both* have been operating. Otherwise they might develop misalignment from unequal expansion.
- If you haven't done so already, send for your *free* copy of "Handbook for Wartime Care of Centrifugal Pumps". Contains *no* advertising. ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WISCONSIN. A 1707

ALLIS-CHALMERS PUMPS

Allis-Chalmers builds all types and variations of pumps shown at right. Capacities from 10 to 150,000 gpm, heads to 2500 lbs.

LENGTH for LENGTH, DOLLAR for DOLLAR...

it's a good investment



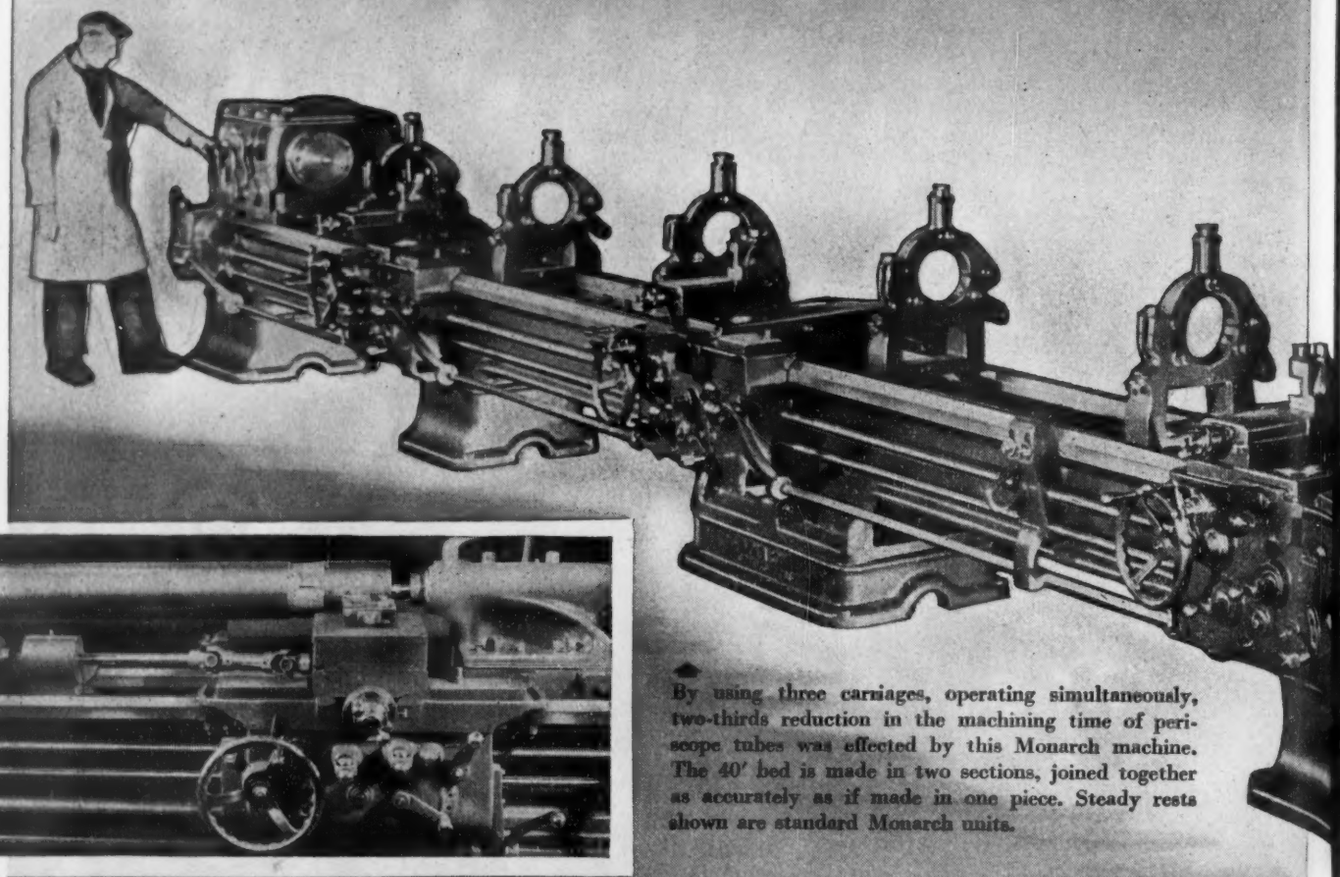
Bethlehem Pipe is the pipe for all your piping needs. Not only does it give long, trouble-free service because of its uniformity and ductility, but it is remarkably easy to cut, thread and weld.

Many leading users of steel pipe consistently specify Bethlehem Pipe. It's excellent for use as industrial piping, in railroad service, in plumbing, and in both conventional and radiant heating. Wherever pipe is called for, use dependable Bethlehem Pipe.

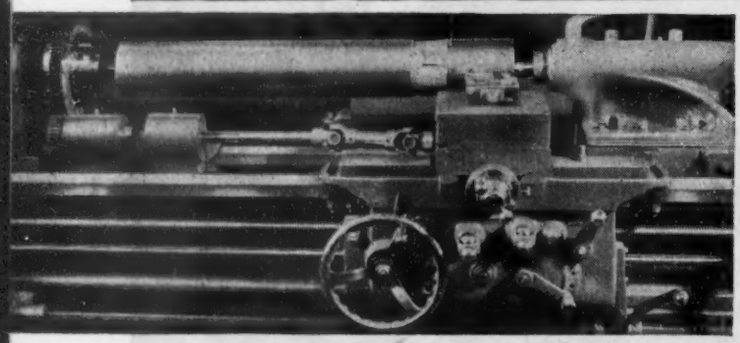
Bethlehem Pipe

BETHLEHEM STEEL

To reduce your turning



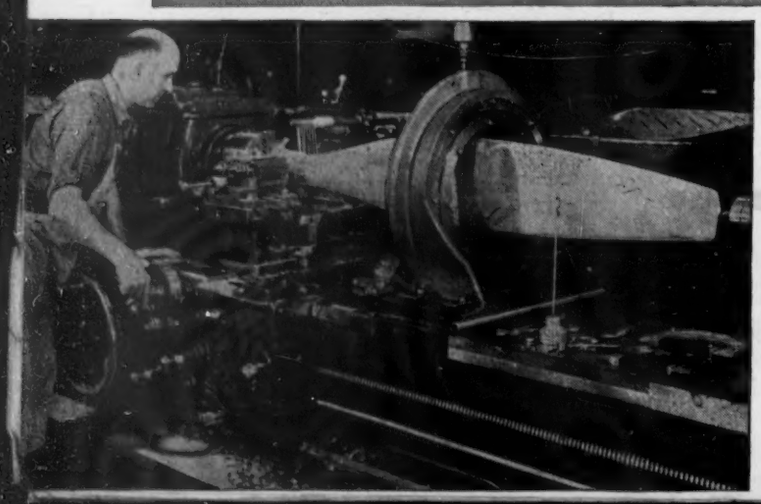
By using three carriages, operating simultaneously, two-thirds reduction in the machining time of periscope tubes was effected by this Monarch machine. The 40′ bed is made in two sections, joined together as accurately as if made in one piece. Steady rests shown are standard Monarch units.

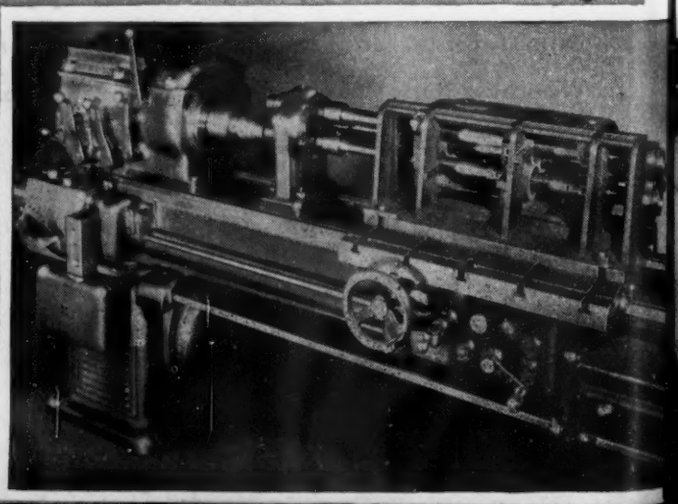


A special contour shape turning device on this standard Monarch lathe was developed to speed delivery of landing gear struts. A large number of these special Monarchs are used in all plants producing this work.

Machining the hub end of this propeller blade requires 13 tools, but is done in one setup on this Monarch lathe. One large propeller plant uses several of these lathes for this purpose.

One operator can handle several of these Monarch lathes, used in our own plant as horizontal boring machines. They are equipped with special type platen carriages, on which the work-holding boring fixtures are mounted. These machines reduce production costs and assure accurate duplication.





costs... SEE MONARCH

Illustrated here are a few of the many ingenious time-saving applications of standard or special Monarch lathes for war production. Postwar, machines such as these will more than pay their way by delivering increased output of high quality turning, boring or facing work. Especially, they will help offset higher man power costs. If you would like a demonstration of how Monarch turning machines can be profitably applied to your work, our engineers are at your service.

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO

DIRECT FACTORY BRANCHES:

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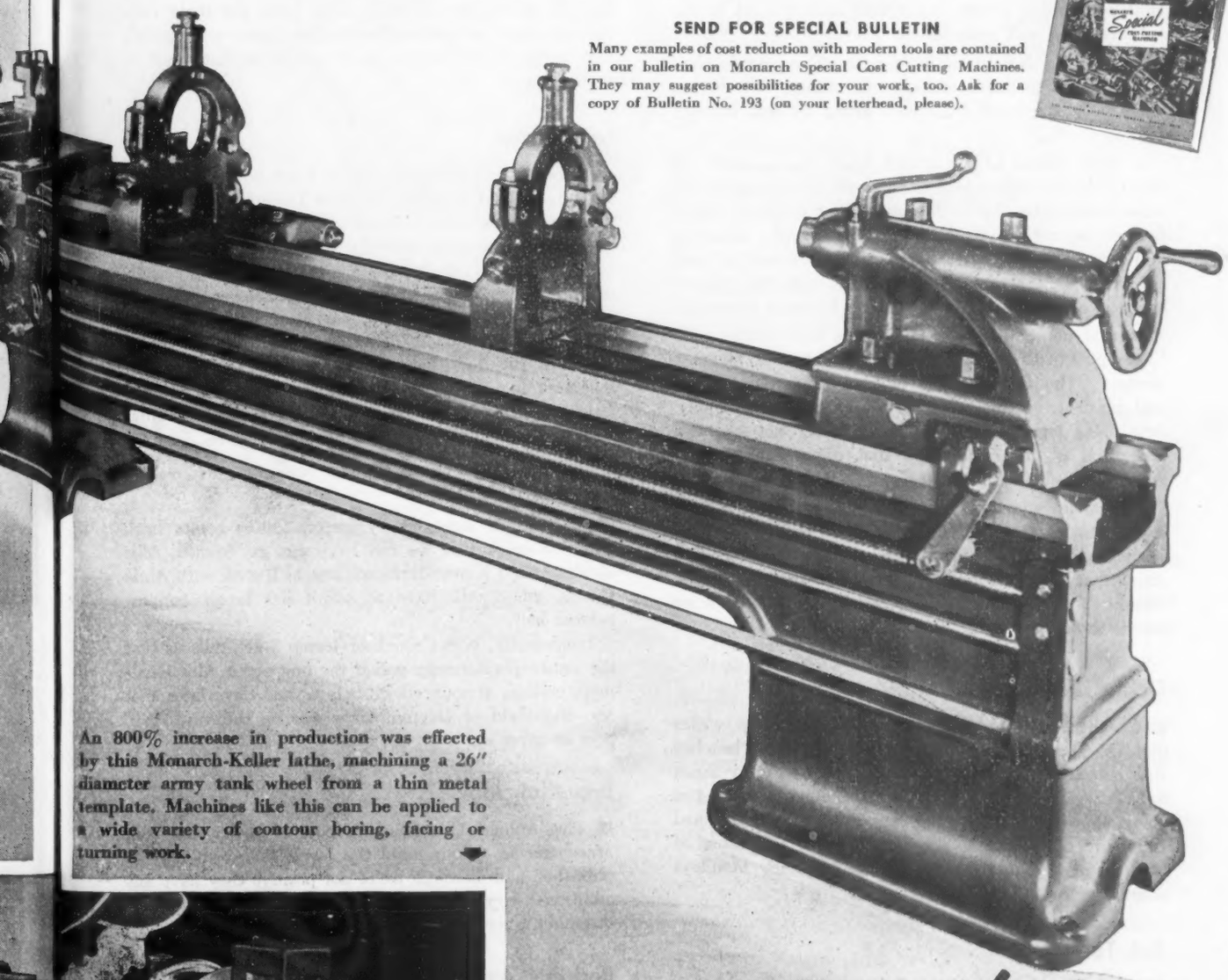
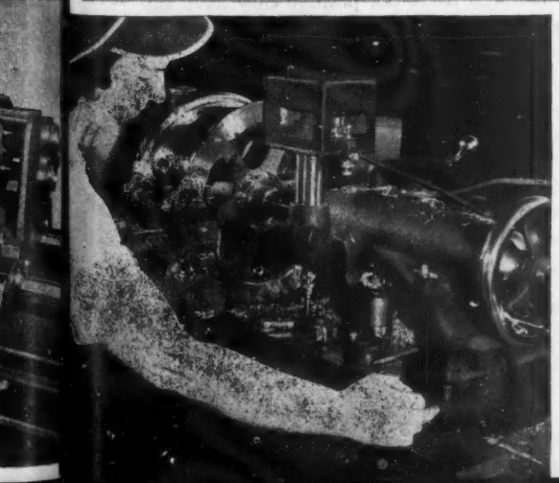
Representatives in principal cities

SEND FOR SPECIAL BULLETIN

Many examples of cost reduction with modern tools are contained in our bulletin on Monarch Special Cost Cutting Machines. They may suggest possibilities for your work, too. Ask for a copy of Bulletin No. 193 (on your letterhead, please).



An 800% increase in production was effected by this Monarch-Keller lathe, machining a 26" diameter army tank wheel from a thin metal template. Machines like this can be applied to a wide variety of contour boring, facing or turning work.



Monarch Saves Time

BEHIND THE SCENES

Hats Off to the P.A.

■ Julian G. Davies, purchasing agent and treasurer of N. Slater Co., Ltd., Hamilton, Ontario, and vice-president of the National Association of Purchasing Agents rightfully comes to the plate for his fellow-buyers to answer the mean things said about p.a.'s in this very spot December 18. As a matter of fact, Mr. Davies snickered only moderately as he read it, and as a feeble attempt to copy the oft-quoted effort of the late Elbert Hubbard, it didn't seem nearly as funny, nor important enough to dignify with a response, or to warrant an acceptance of our invitation to "pour it on". But we're glad he did, and here are some of Mr. Davies' comments:

President Roosevelt has publicly expressed, on several occasions, his high opinion and complete approval of the vital part which purchasing agents have played in the outpouring of war materials.

Mr. Donald Nelson, at the height of war production, was reported in the newspapers as saying, "Purchasing agents are the most important group in this country today."

A high official of the armed forces has pointed out that of the 90 billions of dollars' worth of military equipment ordered by the U. S. government during a stated period, more than 60 billions were actually allocated and converted into war supplies on the orders of purchasing agents, at a time coincidental with the greatest shortage of raw materials the country has ever witnessed.

In that non-fiction best seller of a few months ago, "The Spirit of Enterprise", the author, Edgar M. Queeny, wrote: "The thousands of purchasing agents are the real guardians of the American people against monopoly. Purchasing agents have business sense, not political sense. It is they who insist that prices shall bear a reasonable relationhip to cost".

Mr. Davies says he could go on with many other such comments by showing that P.A.'s are really quite respectable gentlemen after all, and we're quite willing to admit that he's sold us lock, stock and barrel. If any salesmen have anything to say, let them speak now or forever hold their peace.

Doctor Bows Low

■ Charlie Stewart of Muehlhausen Spring Corp. writes that Dr. Bunbottom bows as low as his tight britches will permit in thanks for running his masterful thesis on "Dawgs", and says the Dr. is now considering a companion piece on "Trees" requested by the National Lumbermen's Journal. We hope to give you more of the Doctor's laugh tonic one of these gloomy Mondays soon.

Rat Test

■ Fred Chambers of National Gypsum crashes through with a classic picked up from the *American Glass Review*.

It seems that since Foamglas, produced by Pittsburgh Corning, came into existence it has survived the moisture-proof test, the shock and abrasion test, the vermin-proof test, and the fire test. It has been pulled, squeezed, cut sheared and torn; mauled, twisted and beaten. Then, out of a clear sky someone wanted to know: Is it rat-proof?

Well, no one knew for sure, so they set up tests with a healthy male rat in a box with Foamglas walls. Outside were plenty of yummy things to eat, and through the walls were small holes not big enough for Mr. Rat to get through. Well, the first rat just sat in there and died, and so they tried another and another but they all just couldn't make it, but that didn't satisfy the testers. It was suggested a rat might do anything for love, and another box was built with a Foamglas partition and a wire top for observation. A well-fed male rat was put on one side, a glamorous female on the other. Through the holes in the partition they gazed into each other's eyes. But that was all. They never got together and Foamglas was pronounced rat-proof.

But Fred Chambers is not so sure. What, he says, if the glamorous female might have been the male rat's mother-in-law, or perhaps he was the glamorous female's first husband? Or maybe all it proves is that a rat is a rat after all!

Lord Byron

■ After reading that lyric lilt of Lord Byron Snell, his old friend Gerry Haddock of Atlas Lumnite Cement Co. asks the unanswerable—"What hath Pittsburgh wrought?" But he argues fiercely with the scurrilous remarks of one Harry Wood, and finds instead a cosmic touch, a certain something, perhaps a longing for expression. Above all, he discerns a sense of atmosphere, a touch of geographic immediacy, unmatched, perhaps, in American poetry in our time. He, does, however, feel this is the climax and that anything else along this line would be just too, too much. And, our good friend Byron, notwithstanding, with that last statement we're inclined to agree.

Another Gal Friend

■ One of our more widely versed editors comes back with the crack that we can have our gal friends, Allis Chalmers and Norma-Hoffman, but he'll stick with Anna Conda, who, we'll have to admit has lovely copper-colored hair.

Incidentally, Wib Crouch of Jessop Steel, tells us that the same operator who pulled the one about Allis Chalmers calling, announced blithely a few days later that Mr. Rightfield of Dayton, Ohio was on the wire. Wib says he gives up.

Beautiful Job

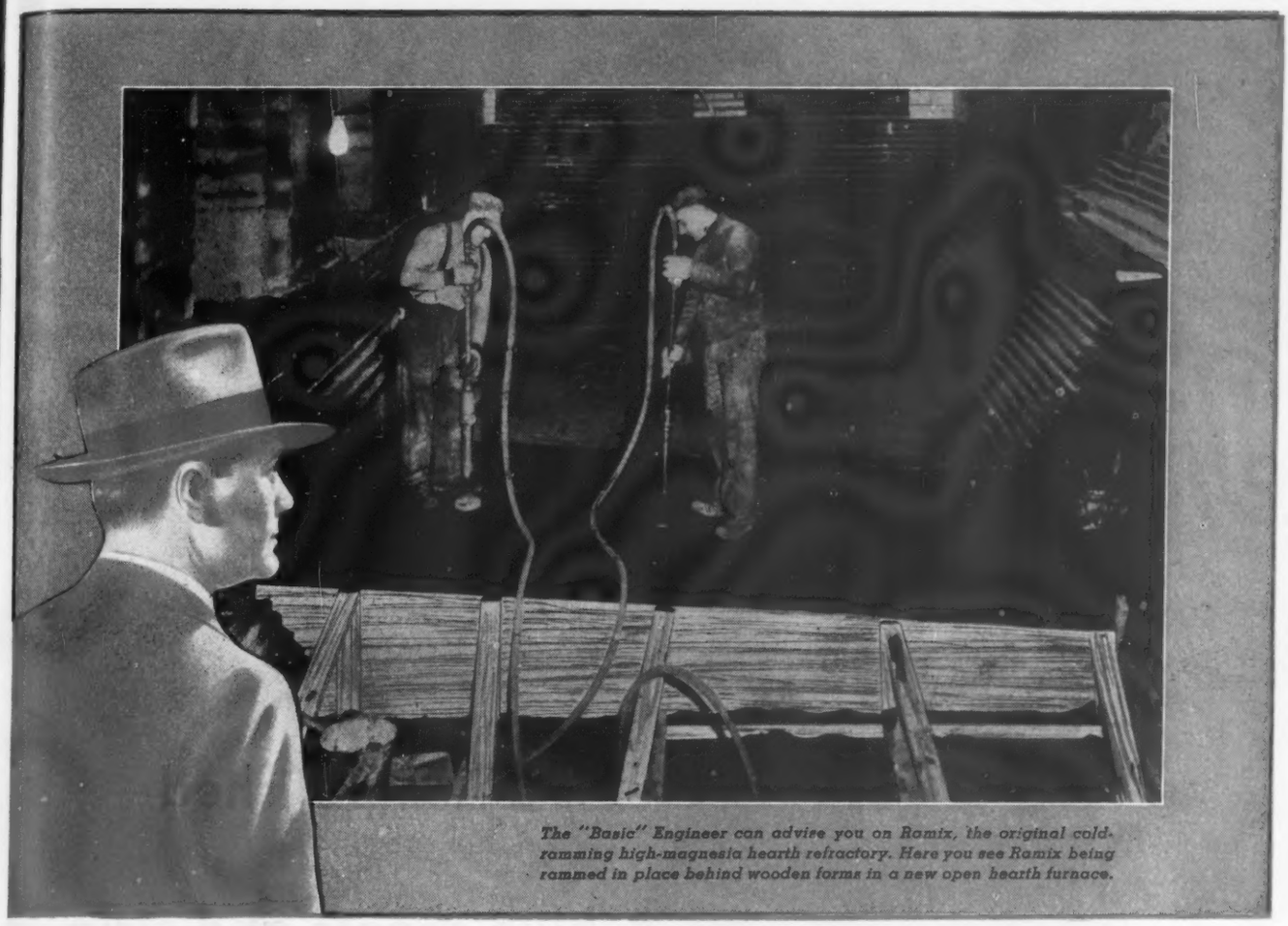
■ The Annual Christmas Edition of the Louis Allis *Messenger* is, to our mind the loveliest they have ever published and although we're not positive they have any additional copies, it would certainly seem worthwhile dropping a note to Milwaukee and saying please.

Reprints Available

■ The series of articles on "Metallic Arc Welding Electrodes", by Harold Lawrence, which appeared in STEEL has been reprinted in an eighty-eight page booklet. Copies are now available at $1.00 each, with special prices for quantity orders.

Vol. 116, No. 3, January 15, 1945, issue of STEEL, published every Monday at Cleveland, Ohio. Entered as second class matter at the post office, Cleveland, O., under act of March 3, 1879. U. S. and possessions, Canada, Mexico, Cuba, Central and South America, 1 year $6; 2 years $10; all other countries, 1 year $12. Current issues, 25c. Yearbook of Industry issue, $2.00.

Editorial Contents—Page 37



The "Basic" Engineer can advise you on Ramix, the original cold-ramming high-magnesia hearth refractory. Here you see Ramix being rammed in place behind wooden forms in a new open hearth furnace.

HE'S YOUR REFRACTORIES ENGINEER

Always at your service is the Basic Refractories Sales Engineer—whether you buy carloads of Magnefer or a few bags of 695 Plastic for taphole repair.

This man is, first, a practical steel man. To years of experience at actually making steel, he adds intimate knowledge of basic refractories. Taking your orders for so many tons of prepared dolomite or quick-setting magnesite is only part of his job—and a small part, at that.

More important to you, the "Basic" engineer is qualified to help you lick any tough refractory problem—in the open hearth, or the electric steel furnace, or most any other type of ferrous or non-ferrous furnace. You can use his knowledge and experience freely—when you're putting in new hearths, or want to repair or resurface old bottoms, improve taphole practice, or reduce slagline maintenance. He may be able frequently to save you time and trouble, labor and refractory expense.

Back of the "Basic" Sales Engineer is an organization with just one goal—to supply the kind of dependable refractories and service that steel makers need and want. So don't hesitate to call him in—to discuss your everyday refractory problems, your long range plans, or any emergency job.

BASIC FURNACE

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blue sheets and strip

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Here's another product that demonstrates the skill of Follansbee steelmakers. You can *see* the quality of Follansbee Polished Blue Sheets and Strip in the lustrous, uniform color, the smooth, highly polished surfaces. You can *prove* their quality in manufacturing processes that demand exactness in Temper and Gauge.

In every operation—pickling, rolling, annealing, blueing, polishing—Follansbee experience and high standards contribute to the making of the finest Polished Blue Sheets and Strip.

You're sure of the best when you specify Follansbee Polished Blue . . . and you can rely on Follansbee with equal certainty for other products ranging from Cold Rolled Strip to steel alloys and steel specialties.

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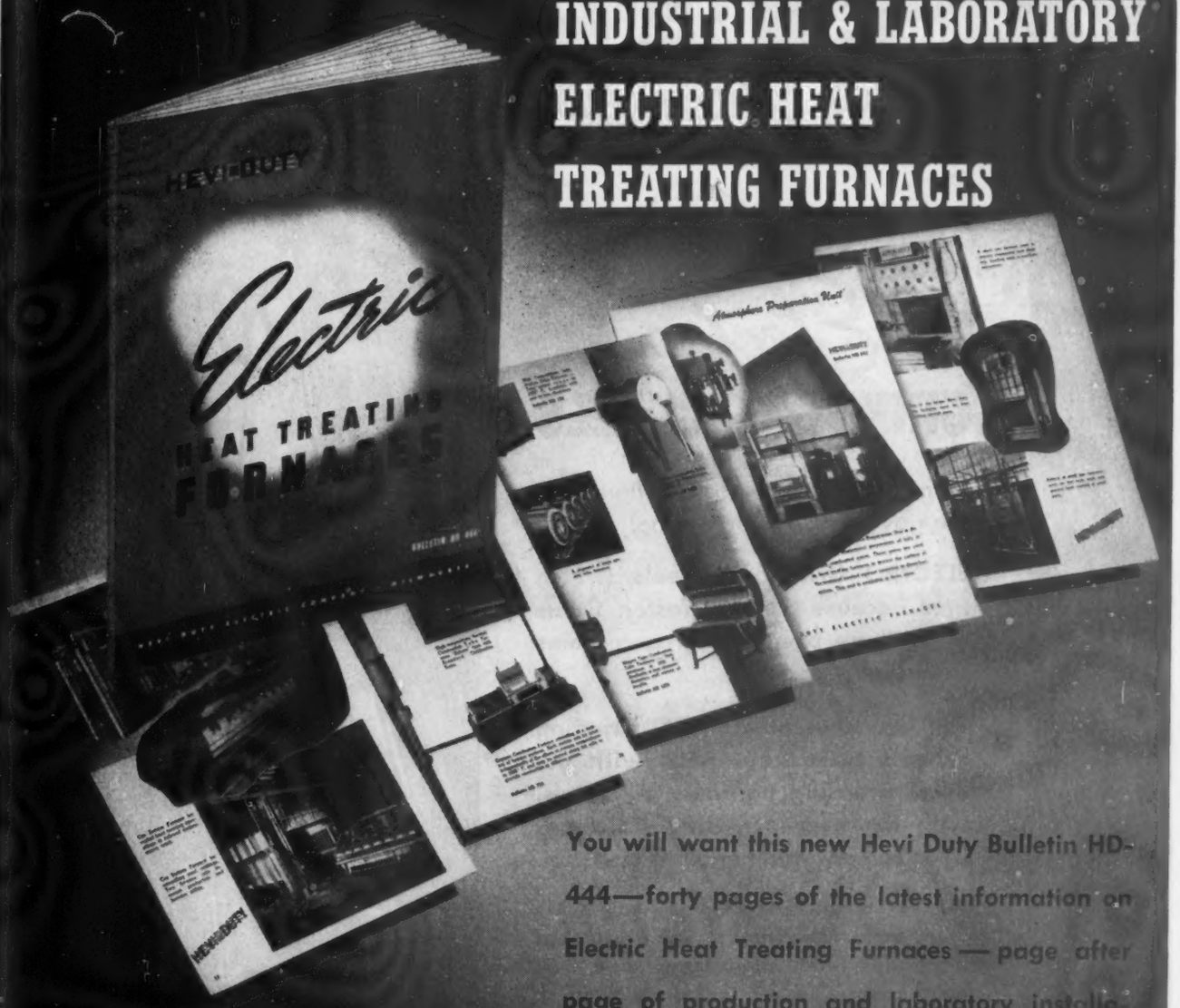
POLISHED BLUE SHEETS . ELECTRICAL SHEETS & STRIP . SEAMLESS TERNE ROLL ROOFING

A New Bulletin

on HEVI DUTY INDUSTRIAL & LABORATORY ELECTRIC HEAT TREATING FURNACES



You will want this new Hevi Duty Bulletin HD-444—forty pages of the latest information on Electric Heat Treating Furnaces — page after page of production and laboratory installation pictures — help for planning your after-war program — send for your copy now.

HEVI DUTY ELECTRIC COMPANY

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From billet grinding to tool finishing, the governing factor is *time*.

ELECTRO Grinding Wheels stretch *time* because they cut *faster*. Gains of 10% are common; greater gains are often reported.

The structures of ELECTRO Grinding Wheels have kept pace with the ever-increasing hardness of metals, with the ever-increasing insistance upon cooler cutting and less dressing.

ELECTRO Engineering to help you apply these eminently superior wheels to your production, is immediately available. Why not phone us now? Call Buffalo, N. Y., WAshington 5259.

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OIL
SUPER-7 STATIC-RESISTING TALKING: MY BUILT-IN CONDUCTING ELEMENT CARRIES STATIC CHARGES TO MACHINES WHERE THEY'RE GROUNDED.
HEAVY LOADS? EASY! MY STEEL CABLES ADD POWER, REDUCE STRETCH AND SLIPPAGE. I'M SUPER-7-STEEL.
90% OF ALL OIL CONDITIONS ARE A CINCH FOR ME. NEOPRENE IS MY COVER..SUPER-7 OIL-RESISTING, MY NAME.
HOT-RUNNING DRIVES ARE WHERE I SHINE. 180°F IS JUST COMFORTABLY WARM FOR SUPER-7 HEAT RESISTING. THAT'S ME.
A 1771

YOU'RE SURE TO GET TOP-FLIGHT DRIVE PERFORMANCE WHEN YOU SPECIFY ALLIS-CHALMERS TEXROPE V-BELTS . . . EACH BELT IS DESIGNED, TESTED AND BUILT TO SOLVE SPECIFIC DRIVE PROBLEMS

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Fighting for their country, millions of men from every walk of life are learning the value of good mechanisms . . . and the springs that help to make them work. Their trained hands will be quick to judge the worth of the products of the future. Their influence will affect mechanical developments in many fields. For those men who will improve, invent, pioneer the products of a country again at peace, the Wallace Barnes Company offers the resources of an organization trained to design and produce good springs in their infinite variety.

CONSERVE METAL — DESIGN WISELY

1918 — THEN AND NOW

ARMY E NAVY

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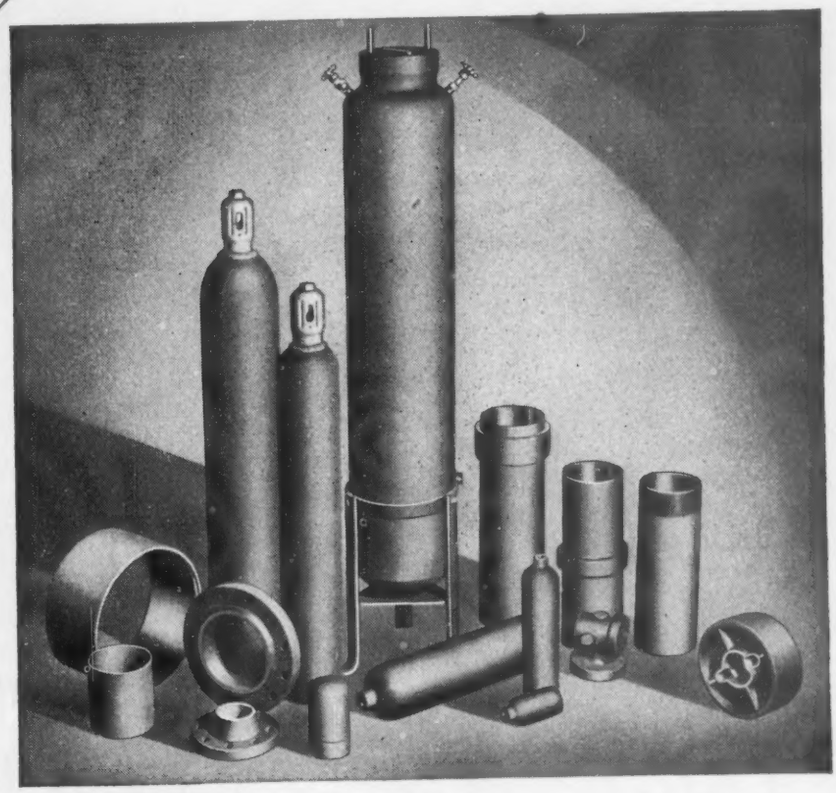

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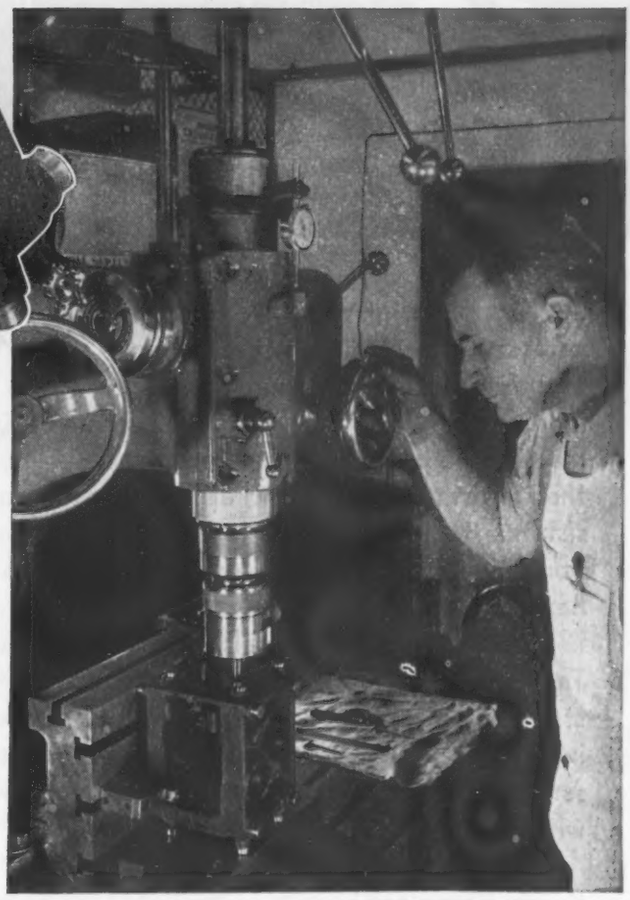
TEMPERED AND UNTEMPERED FLAT AND ROUND HIGH CARBON WIRES

15 HOLES TO +0000-0.0001" ON A Cleereman JIG BORER



Here is a job that is characteristic of the extreme accuracy of Cleereman Jig Borers. Fifteen holes, ranging in size from ¼ in. diameter to 1¼ in. diameter, are bored in this fixture. All these holes are bored in proper relation to locating pads on the fixture and in relation to each other to the limit of +0000—0.0001 in. Furthermore, all holes are held accurate for angle when the fixture is rotated to four positions.

The Cleereman Jig Borer is unsurpassed for extreme accuracy, range of adaptability, and speed of operation. Write for catalogs on Cleereman Jig Borers and Cleereman Drilling Machines.

ARMY E NAVY

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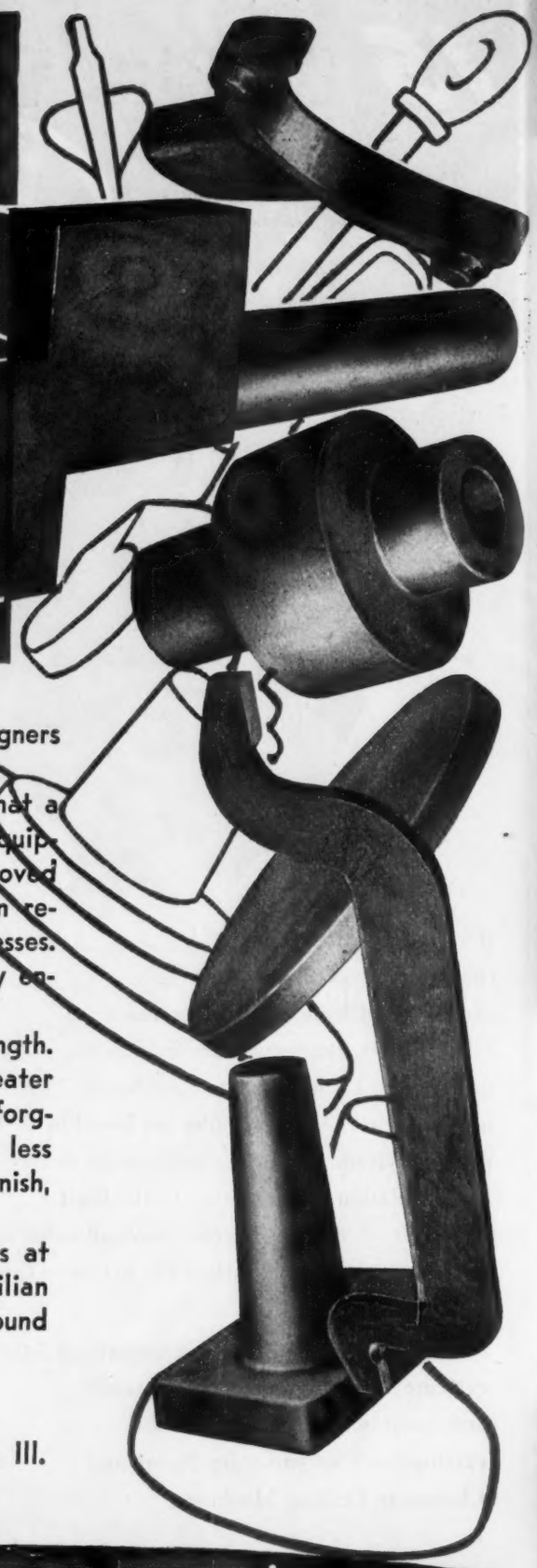
BLUEPRINT YOUR POST-WAR FORGINGS REQUIREMENTS *Now!*



At Kropp Forge we are already working with designers of postwar machines and equipment.

It is gratifying, though not surprising, to note that a more extensive use of forgings is involved in the equipment of the peacetime era. Forgings have liberally proved their worth in armament applications — notably in resistance to tensional, torsional and compression stresses. Forgings are coming out of the war with a greatly enhanced reputation.

Forgings provide metals at their ultimate strength. They save metal, weight and space because their greater strength permits the use of parts of less bulk. With forgings there is less incidence of internal defects and less scrap. Forgings require less time to machine and finish, with proportionately lower tool costs.

As our war assignments are completed, facilities at Kropp Forge are becoming available for essential civilian applications. Design your postwar products around sound Kropp *flat die, drop or upset* forgings.

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ARMY ★★ E ★★ NAVY

The tap on this vital operation produced 84 pieces after cold treating. It was still sharp and true.

TAP LIFE INCREASED

From 7 to 84 Pieces per Sharpening . . . by *Cold Treating* in a *Deepfreeze* Industrial Chilling Machine!

Deepfreeze Cold Treatment Cuts Costs by Increasing Tool Life . . . Increases Production by Cutting "Down Time" of Machines on Vital Operations

The value of applying Deepfreeze cold treating to increase cutting life of small tools is exemplified by the experience of this manufacturer. In tapping tank drive gear parts it was found that after machining a relatively few pieces, the crest of the 1/2" pipe tap burnished or the tap chipped on face of thread. This made frequent sharpening necessary, proved extremely costly and slowed production considerably.

To remedy this and to reduce interruptions in the production of this operation for frequent tool changes, taps were subjected to the sub-zero treatment in a Deepfreeze −120° F. Industrial Chilling Machine.

Photomicrographs taken both before and after treatment showed that the cold-treated tap had a much finer Martensitic structure with little Austenite. Rockwell "C" Scale hardness of the metal was increased from 64 to 65 1/2. Actual tests revealed that over 84 pieces could be tapped per sharpening with the cold-treated taps against 7 pieces average for untreated taps . . . for an *increase in tool life of 1200%*.

In addition, the quality of the work with the cold-treated taps more closely adhered to air corps specifications for thread-smoothness and accuracy. Machine "down time" was also perceptibly decreased.

Cold Treating Has Many Valuable Applications . . .

Deepfreeze Cold Treating has proven profitable in many industrial applications. New uses are reported every day. Here are just a few:

1—Treating high-speed steel cutting tools.
2—New shrink-fit assembly applications.
3—Stabilizing gauges and other precision instruments.
4—Dimensional stability obtained in parts requiring close tolerances.
5—Elimination of distortion after machining.
6—Salvaging of parts and tools.
7—Testing of instruments and materials.

FREE BOOKLET . . . Cold Treating Practice with a Deepfreeze

Up-to-the-minute facts that will show how you can profitably apply it to your own production. It also lists numerous cold treating procedures successfully employed by such manufacturers as Ford Motor Company, Kearney & Trecker Corporation, Savage Tool Company, etc.—procedures which, possibly, you can use. Write for your copy today. Ask for Bulletin I-4.

Only Motor Products can make a "DEEPFREEZE"

Deepfreeze

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Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

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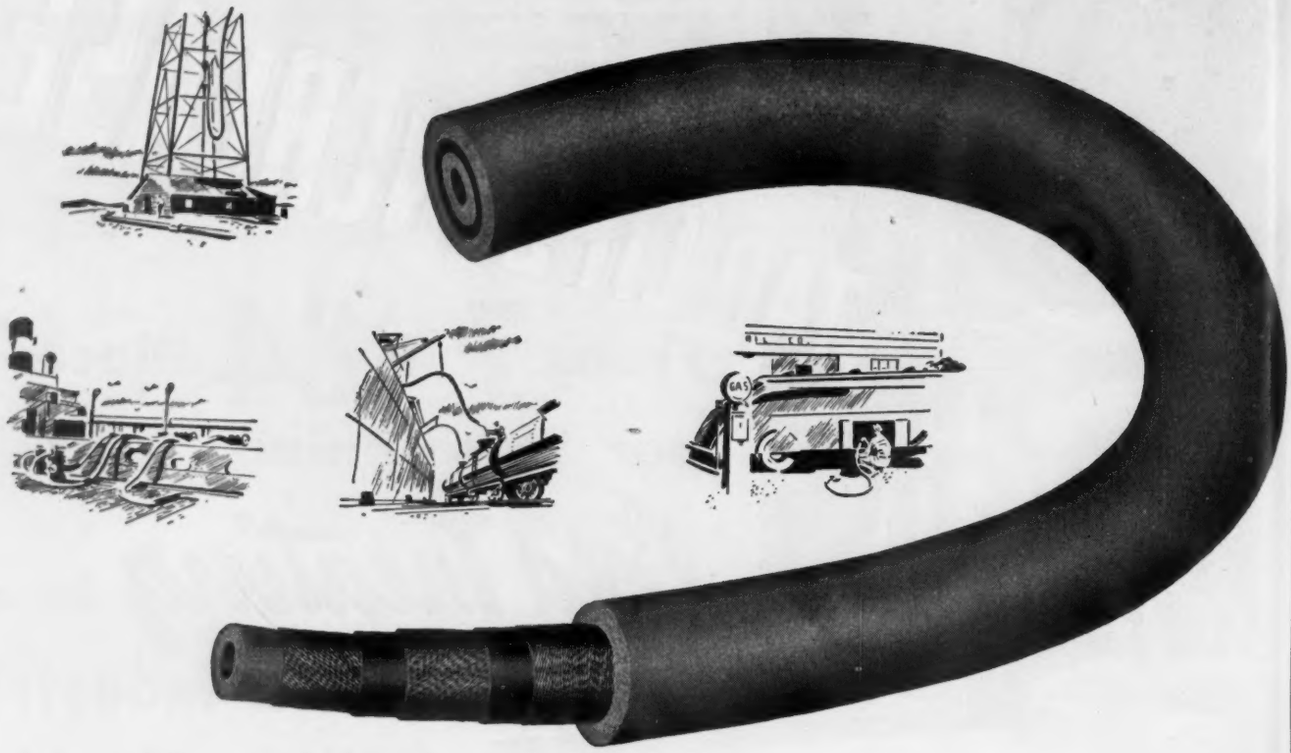


BACKBONE...
For a High Pressure Hose

OIL well rotary drilling hose has to take pressures up to 5,000 pounds, stand up under constant flexing and re-flexing, carry heavy volumes of fast-flowing mud to lubricate the drilling. It takes plenty of *backbone* to hold up under that kind of strain, and so in this hose, as in many other types, the backbone is steel wire.

Only the highest quality steel *wire* can provide the necessary reinforcement for strength and long life . . . its use in fabricated form helps provide the highest degree of flexibility necessary for this rugged service.

That's why most leading hose manufacturers have consistently specified braided *steel wire* especially developed with essential characteristics for hose reinforcement.

Developing and producing that kind of wire has been National-Standard's main job since the early days of the rubber industry. Close cooperation between rubber engineers and National-Standard wire experts has resulted in uniform high quality wire for many types of hose, brought forth time-saving, cost-reducing machinery for the application of wire into finished products, and has lead to many *new* uses for wire with rubber. Tires, airplane de-icers, conveyor belts, V-belts, and tubing are only the beginning of even greater wire-and-rubber developments to come.

If you have plans for product improvement or development, let National-Standard's experience help with a type of wire and method of application specifically fitted to your product.

BUY AND KEEP WAR BONDS

NS
NATIONAL-STANDARD Company
NILES, MICHIGAN

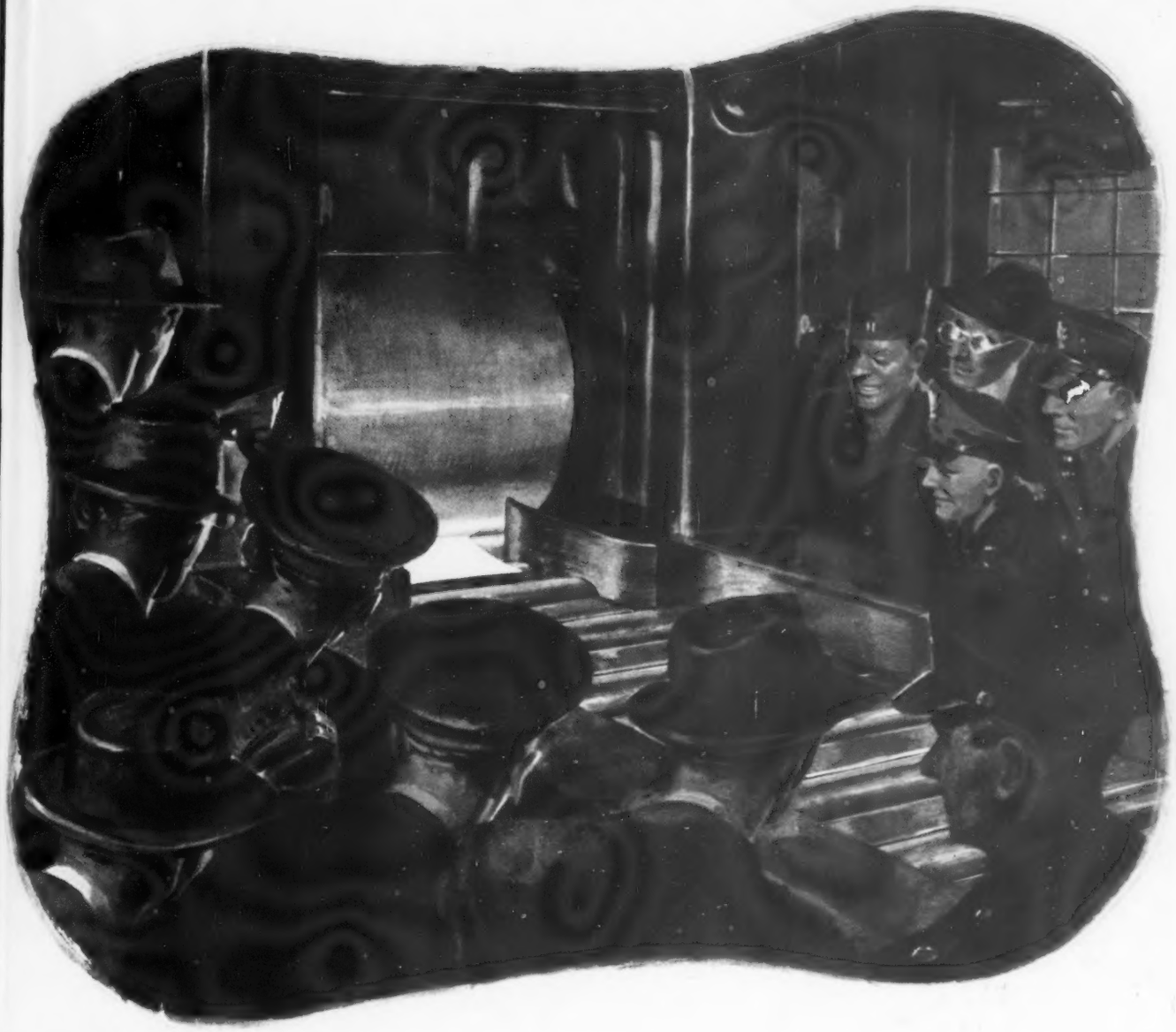
Divisions of National-Standard Company

NATIONAL-STANDARD
Niles, Mich.
TIRE WIRE, FABRICATED BRAIDS AND TAPE

ATHENIA STEEL
Clifton, N. J.
COLD ROLLED, HIGH-CARBON SPRING STEEL

WAGNER LITHO MACHINERY
Hoboken, N. J.
LITHOGRAPHING AND SPECIAL MACHINERY

WORCESTER WIRE WORKS
Worcester, Mass.
ROUND STEEL WIRE, SMALL SIZES



Rolling the Impossible

ON A SPLIT-SECOND SCHEDULE

"Tough jobs," said the Colonel, "are expected, but this one is virtually impossible. It means rolling to practically a *zero* tolerance . . . Other mills say, *it just can't be done.*"

How Weirton meets such requirements is a story of unbelievable precision—an amazing report of perfect integration between advanced industrial thinking and remarkable facilities —the same "know how" that *overnight* made Weirton the sixth largest U. S. producer of rolled brass—the *only* mill ever able to adapt ponderous steel equipment to this delicate operation.

Again, it was Weirton that solved the problem of rolling magnesium in extremely thin gauges. They went to Weirton too, when an important war application required the rolling of silver chloride into plastic-like slabs . . . All in all, Weirton has developed and manufactured ten entirely new, vital products since Pearl Harbor.

These examples of difficult rolling are introduced merely to show the extreme accuracy possible with Weirton's equipment and to illustrate the experience and ingenuity of Weirton's people . . . a winning combination that has already translated itself into remarkable improvements in hundreds of home-front products.

WEIRTON STEEL CO.

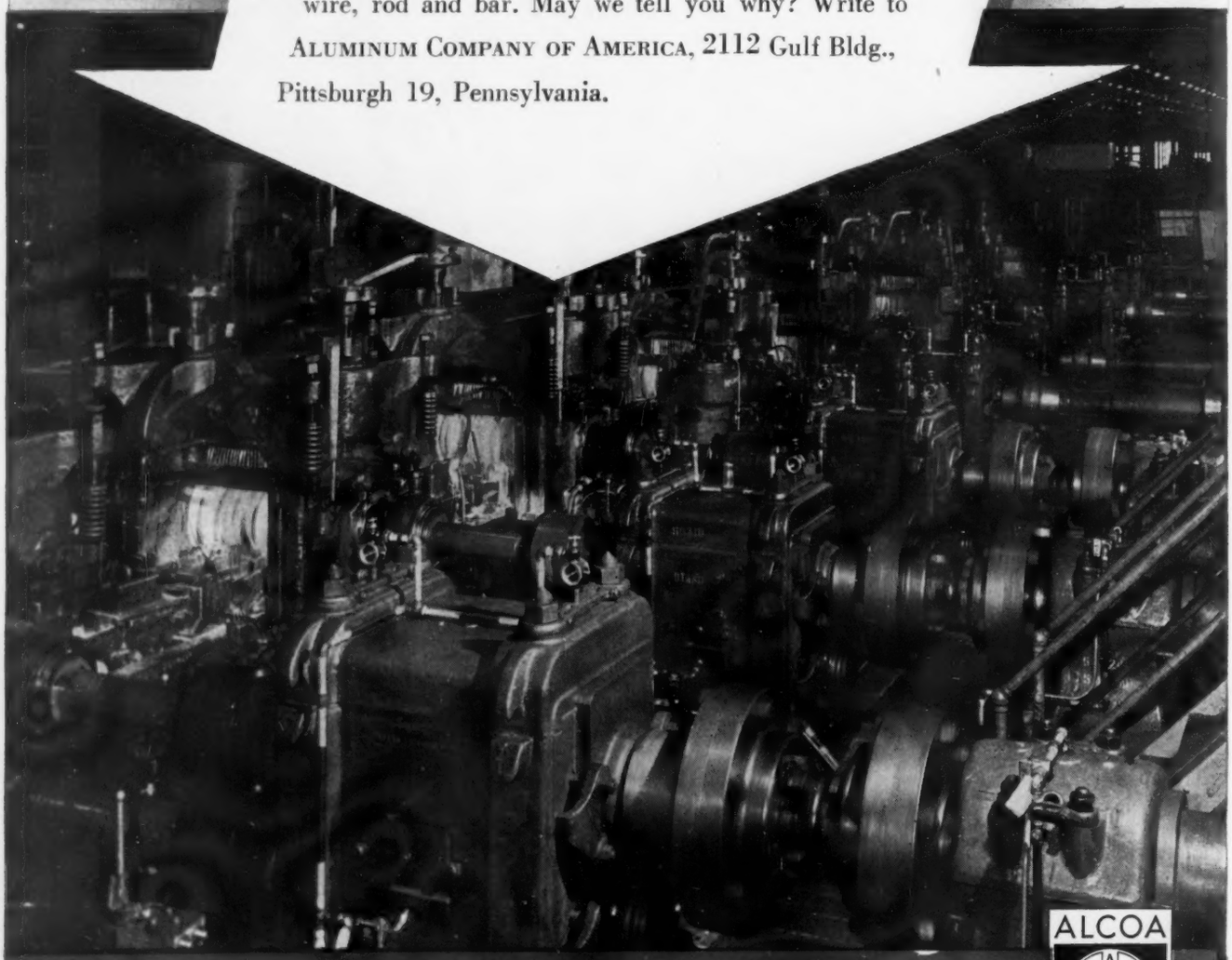
WEIRTON, WEST VIRGINIA · *Sales Offices in Principal Cities* · *Division of* NATIONAL STEEL CORPORATION *Executive Offices, Pittsburgh, Pa.*

This rolling mill is evidence of Alcoa's faith in the future for Aluminum Wire, Rod and Bar

Started as a prewar project, this rolling mill at Alcoa's Massena, New York, plant was rushed to completion to make it available for war production. Aluminum alloy rod and bar stock rolled here has been an important contributor to the war effort.

As wartime demands slack off, the production of this mill will be available to those manufacturers who plan big things with aluminum postwar.

Alcoa has great faith in the future for aluminum wire, rod and bar. May we tell you why? Write to ALUMINUM COMPANY OF AMERICA, 2112 Gulf Bldg., Pittsburgh 19, Pennsylvania.



ALCOA FIRST IN **ALUMINUM**

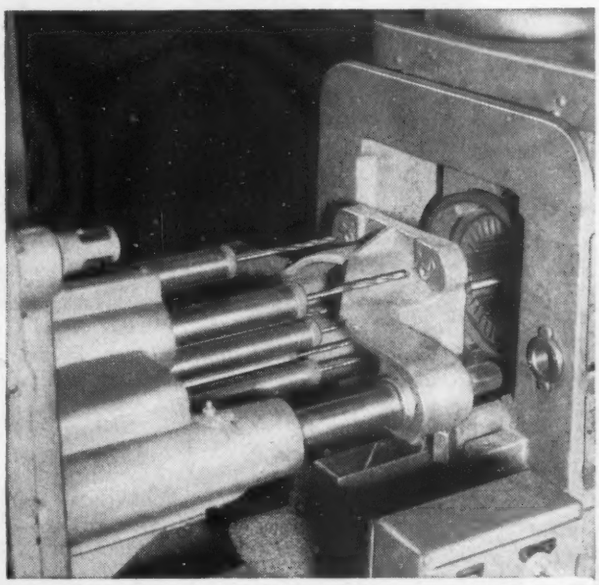
ALCOA ALUMINUM

BLESSED BOLT HOLES

It's a blessing to electricians and maintenance men when bolt holes in motor end shields and frames are exactly in line, and mounting holes in the feet are uniformly and accurately positioned. Installation is easier. Interchanging of motors, rotating of end shields, and reversal of stators are all more quickly accomplished. Tight fits are obtained without forcing. Bearing alignment is insured, internal strains are avoided. During the war period, jig-fixture uniformity maintained in machining, drilling, and tapping Tri-Clad motor frames has saved thousands of man-hours of installation and servicing.

End shields are easily rotated for inverted motor mounting.

JIGS AND FIXTURES OF ADVANCED DESIGN MEAN CLOSE FITS IN TRI/CLAD MOTORS



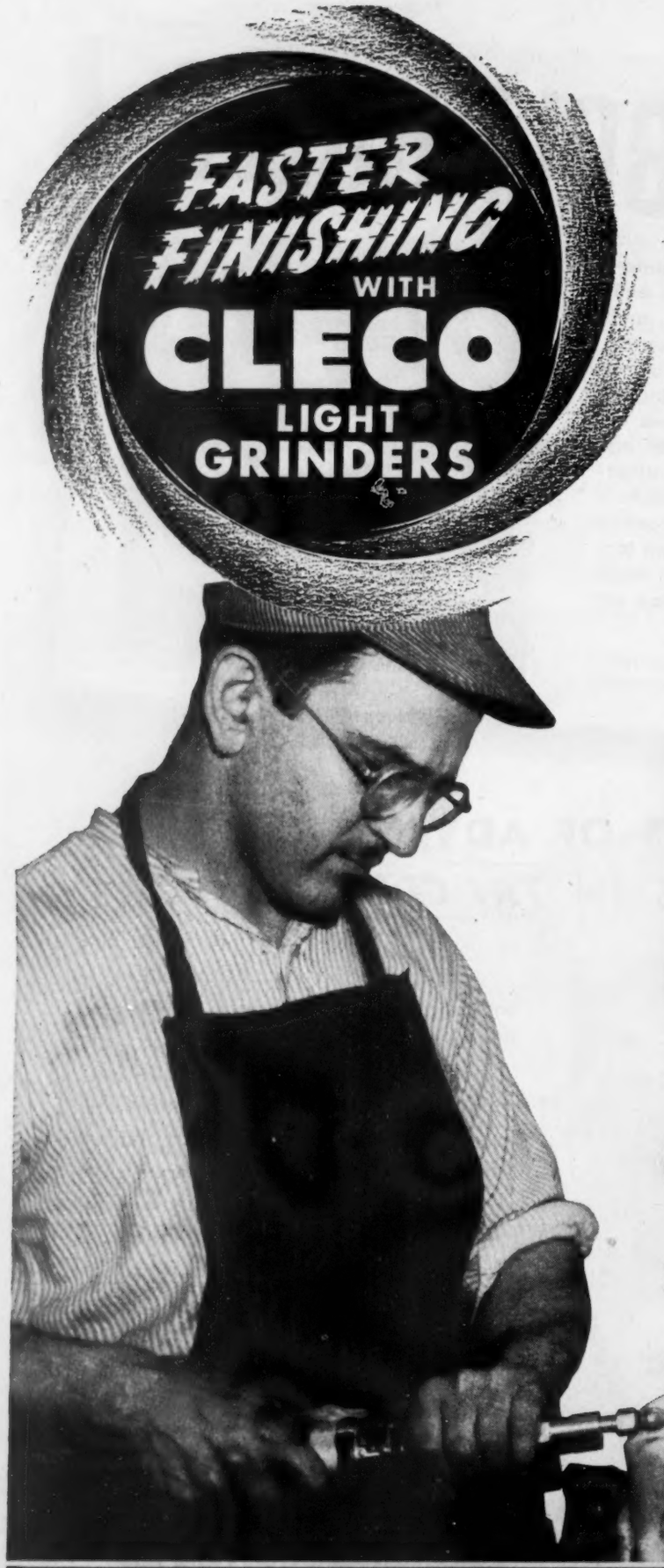
Frame-drilling operation at G.E.'s Lynn (Mass.) Works.

Specially built production equipment, as well as test apparatus, helps build Tri-Clad motors with close fits and clearances. Here, all bolt holes in the frame are drilled in a single operation within a rigid fixture that insures accurate positioning. In the finished motor, this results in more accurate shaft alignment, smoother operation, longer bearing life. General Electric's high-volume motor production permits tooling up for high precision without increasing the cost to you. *General Electric Co., Schenectady 5, N.Y.*

GENERAL ELECTRIC

750-249-6960

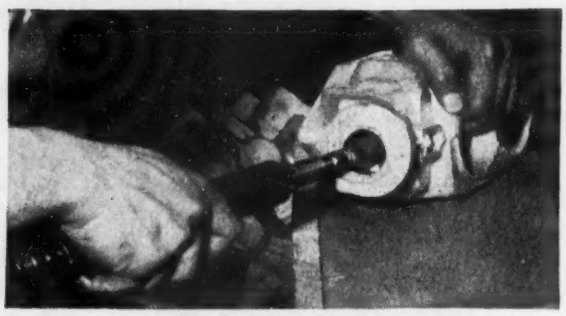
Buy all the BONDS you can—*and keep all you buy.*



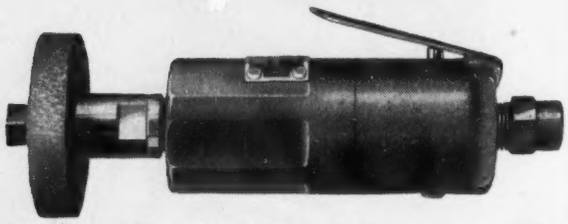
● For finishing forgings, dies, metal patterns, castings and similar work, you can't beat Cleco Light Grinders. They are light in weight, small and easily handled, yet pack plenty of power. The No. 214 series of Cleco Grinders is available at speeds of 14,000 and 18,000 R.P.M. and are governor controlled, while Model 12 is faster at 20,000 R.P.M. Fitted with ⅜", 24 S.A.E. thread spindles. Exhaust deflector included.

Standard equipment consists of spindle nut and washer, and ¼" collet chuck. Spindle extension 1½" or 3" long furnished, in lieu of collet chuck, when specified. Dead handle supplied when so ordered.

Bulletin 80 describes these light grinders in detail, as well as furnishing complete data on the entire line of Cleco Rotary Grinders. Ask for it!



Working inside a casting.



Above, a Cleco 214J light grinder. Below, a Cleco No. 214 smoothing up an aluminum casting, with a rotary file.

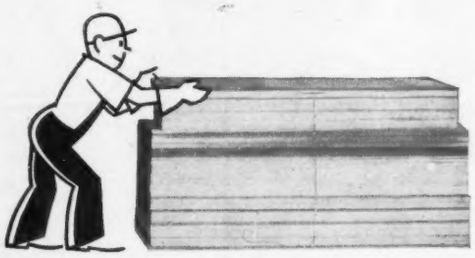
THE CLEVELAND PNEUMATIC TOOL CO.

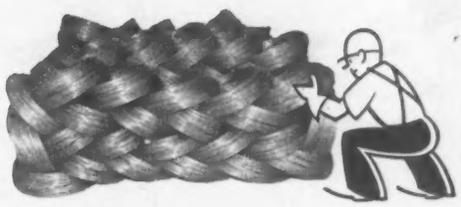
3781 East 77th St. • Cleveland 5, Ohio *Branch Offices in All Principal Cities*

CONTINENTAL* STEEL

A GOOD NAME TO REMEMBER

WHEN YOU NEED SHEET AND WIRE PRODUCTS





STEEL SHEETS

Open hearth steel from Continental's furnaces is made into steel sheets with more than thirty different types of surface treatments, finishes and coatings. Continental specializes in the production of sheets with properties designed to best fit a definite class of duties. This special service in sheets fitted to manufacturers needs helps cut production costs and make better products. Inquiries are invited.

*TRADEMARK REGISTERED U. S. PATENT OFFICE

WIRE *AND WIRE PRODUCTS*

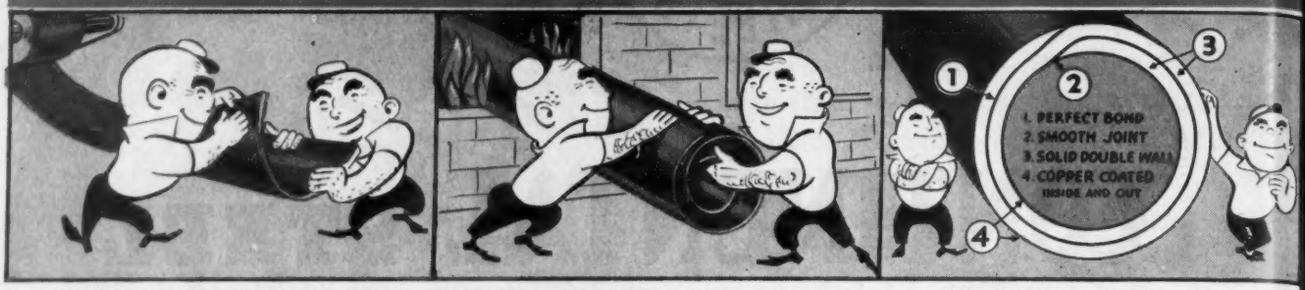
Small enough to stitch like thread or large enough to serve as lever rods on the army's big earth movers . . . that's Continental wire, made of open hearth steel from Continental's own furnaces. Wire for manufacturers is available in standard and special shapes and many different finishes and coatings. Continental's finished wire products include Chain Link fence, widely used for the protection of industrial property.

CONTINENTAL
STEEL CORPORATION
GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF: MANUFACTURER'S WIRE: Bright, Annealed, Galvanized, Coppered, Tinned, Liquor Finished, Lead Coated, Special wire, etc. Also Chain Link Fence, Nails, etc. STEEL SHEETS: Black, Galvanized, Hot Rolled Annealed, Hot Rolled Pickled, Long Terne, Copperior, Lead-Sealed, Galvannealed, Super-Metal, etc.

THE SUPERIOR SHEET STEEL COMPANY, *DIVISION* • CANTON, OHIO

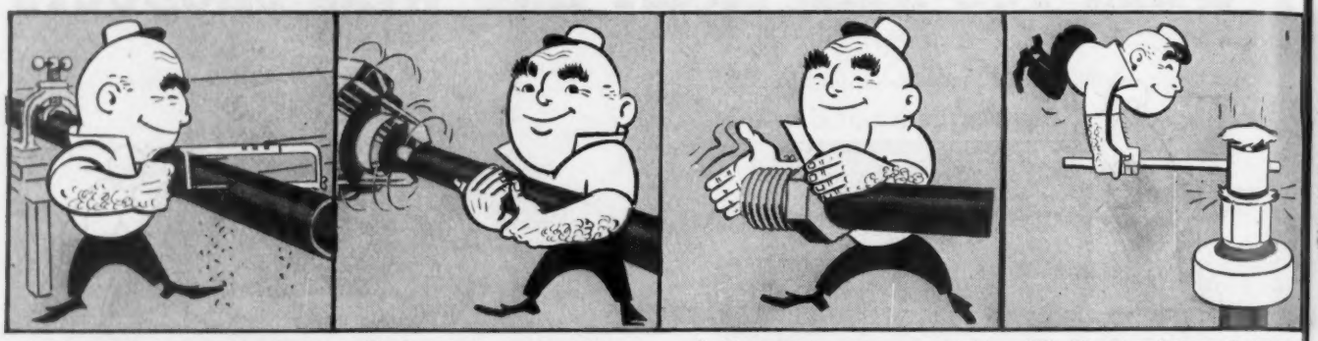
FABRICATING A TYPICAL BUNDYWELD LIFE LINE



1 The Bundyweld Steel Tubing is made by a process entirely different from that used in the making of any other tubing. A single strip of copper-coated S.A.E. 1010 steel is continuously rolled twice around laterally into tubular form.

2 Walls of uniform thickness and concentricity are assured by the use of close tolerance cold rolled strip. This double rolled strip is next passed through a brazing furnace where the copper coating fuses and alloys with the double steel walls.

3 After brazing and cooling, the tubing has become a perfectly bonded SOLID double wall steel tube, completely copper brazed throughout 360° of wall contact, copper coated inside and out, free from scale and closely held to dimensions.

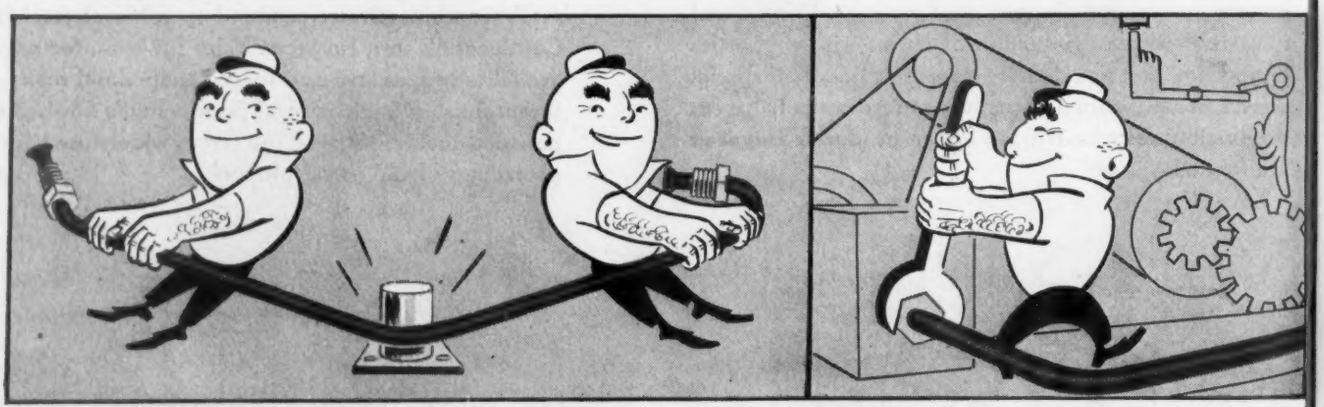


4 The next step in fabrication of a Bundyweld part is cutting to length, which is done at the Bundy plant on a circular saw, or, in the field, with any tube cutter which may be available.

5 The ends of the tube are burred with a specially designed tool with cutting edges of high speed steel which removes both inside and outside burrs in one operation.

6 Next, fittings are assembled. Any of the standard flare, compression type or soldered fittings may be used. Where flare type fittings are used, the Bundy Double Flare is recommended.

7 The Bundy Double Flare, which has been adopted as a standard by the S. A. E., safely permits frequent removal and replacement of fittings, as well as over-torqueing.



8 The last operation in fabrication is bending to shape. Last and most important . . .

9 The Bundyweld part is installed on *your* product.

Bundyweld Steel Tubing is furnished hard or annealed in standard diameters and gauges up to 5/8" O. D. Special sizes cold drawn as desired. Bundyweld is also furnished in Monel. For complete information, contact our nearest representative or write Bundy Tubing Co., Detroit 13.

BUNDY TUBING

ENGINEERED TO YOUR EXPECTATIONS

BUNDY TUBING DISTRIBUTORS AND REPRESENTATIVES:

Pacific Metals Company, Ltd.
3100 19th Street
San Francisco 10, California

Standard Tube Sales Corp.
1 Admiral Avenue
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Lapham-Hickey Company
3333 W. 47th Place
Chicago 32, Illinois

Rutan & Company
112 South 16th Street
Philadelphia 2, Pennsylvania

Eagle Metals Company
3628 East Marginal Way
Seattle 4, Washington

MORE DIGGING into the FORGING QUESTION

CAN YOU *Answer* THESE?

1. For the safety of human lives in the operation of automotive and aviation equipment, why is it imperative to specify forgings for certain parts?
2. In forgings, why should sharp corners be avoided?
3. Where metal parts are subject to constant reversal of stresses, i.e., alternate tension and compression, why are forgings safest?
4. What is a perfect example of a forged part which must be safe under repeated stress reversals in service?
5. Why must forging equipment and forging skill be matched carefully to produce good results?
6. Can we help you in your forging problems now and in your postwar program?

HERE ARE THE ANSWERS

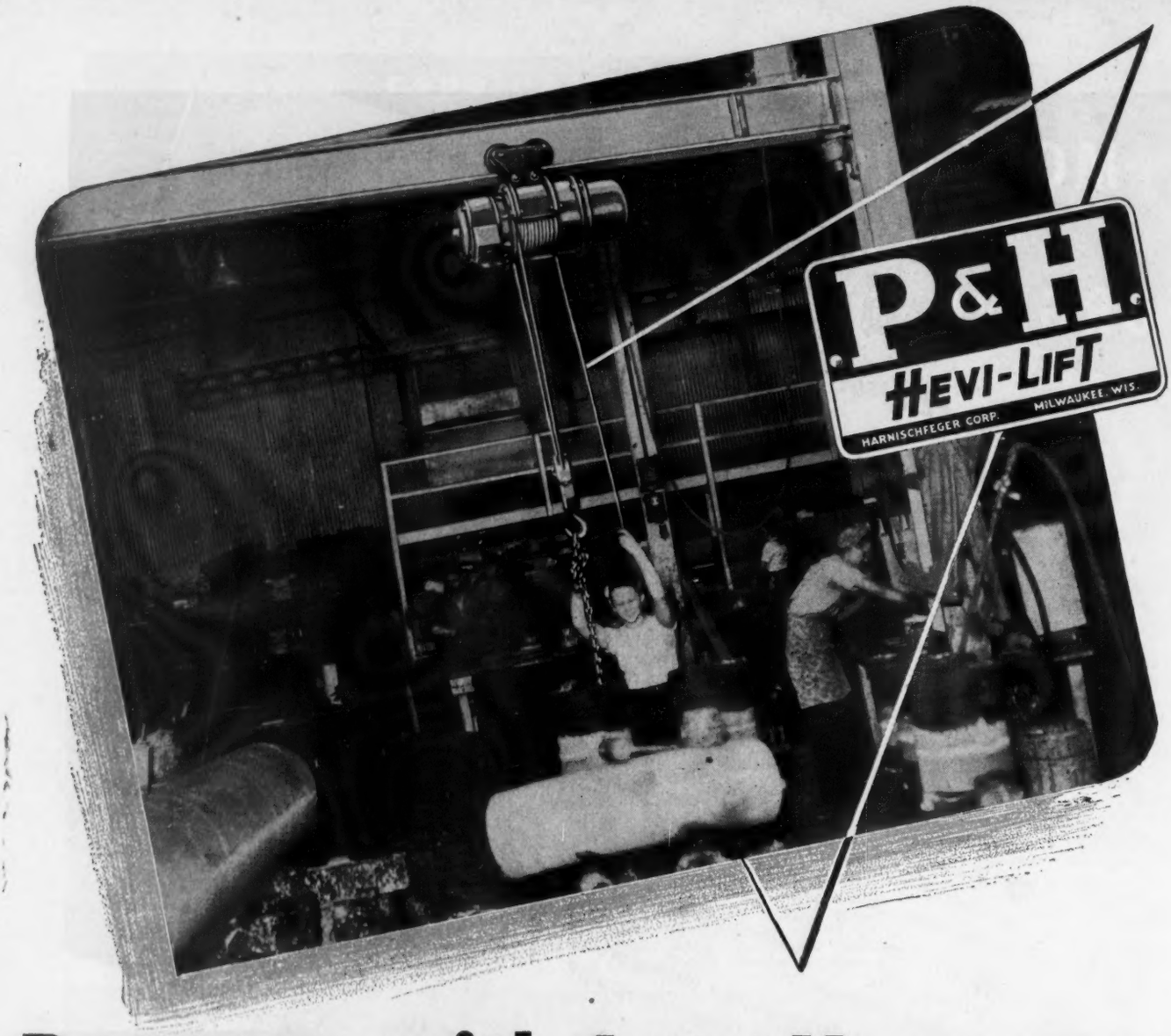
1. Because forgings possess the maximum physical properties characteristic of ductility—elongation, reduction in area, and impact strength. They are tough.
2. Because they are regarded as most frequent cause of fatigue failure.
3. Because the correct practice in forging will result in flawless fibre structure throughout to assure maximum resistance and toughness combustible with the weight of the parts.
4. The Universal Joint . . . it must stand up under impact, fluctuating and reversing loads, and other complex stresses.
5. Because the correct size and type of hammer operated by a skillful hammerman will insure impact pressure on the work sufficient to penetrate and to direction the entire mass of metal throughout its cross-section rather than just on the surface. The result is uniform high structural quality in the forging.
6. Consult with us; together we may work out the most profitable answer.

ARMY E NAVY

ERIE

ERIE FOUNDRY COMPANY, ERIE, PA.

ERIE BUILDS *Dependable* HAMMERS



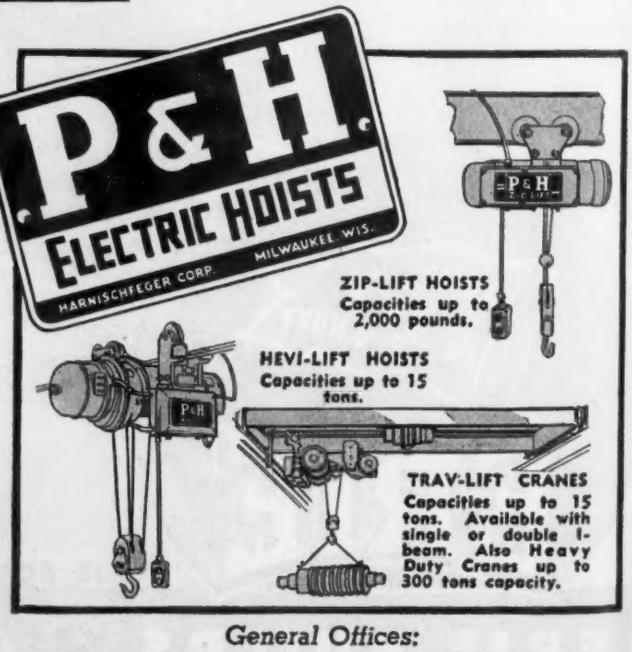
Do more with Less Manpower

Having manpower problems? Why not tap this big manpower reserve that's waiting for you?

This reserve—as big as you care to make it—lies in handling of materials *overhead* . . . with P&H Hevi-Lift Electric Hoists. They enable fewer men—and women to do more—handle material rapidly and easily "thru-the-air" . . . saving workers' time and energy, speeding production—cutting costs.

The lifting of parts from machines . . . whisking them to new stations . . . positioning for the next operation—is all done by the simple pushing of buttons. For the moving of *any* material from one point to another, electricity does the work.

Plants equipped with P&H Hevi-Lift Hoists today will also be ready tomorrow when low-cost production will be more important. P&H Hevi-Lift Hoists can be engineered to your specific needs—or adapted to any Monorail System. Call your P&H representative or write for big new Bulletin H5-1 of facts and pictures.


P&H
ELECTRIC HOISTS
HARNISCHFEGER CORP. MILWAUKEE, WIS.
ZIP-LIFT HOISTS
Capacities up to 2,000 pounds.
HEVI-LIFT HOISTS
Capacities up to 15 tons.
TRAV-LIFT CRANES
Capacities up to 15 tons. Available with single or double I-beam. Also Heavy Duty Cranes up to 300 tons capacity.

General Offices:

4411 W. National Avenue, Milwaukee 14, Wis.

HARNISCHFEGER
CORPORATION

HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

Since stainless steel retains its toughness at low temperature, it gives satisfaction in this immersion type quick-freezing unit.

In Quick-Freezing Plants *Stainless Steel* Helps to Protect Food Quality

• In quick-freezing plants stainless steel is chosen for equipment because it resists corrosion from moisture and food acids, is attractive in appearance, easy to keep clean and sanitary, and lasts for years.

In equipment both for food preparation and for the freezing process, stainless steel helps to provide the protection so necessary where food is handled, and contributes to efficient, profitable plant operation.

The use of stainless steel cuts maintenance time and expense and helps to maintain high-quality production because its corrosion-resistant surface will not affect food flavor or color.

These properties make stainless steel a practical choice for equipment, not only in plants for the processing of frozen foods, but in canning, dehydration, beverage, meat packing, and dairy plants as well.

Although we do not make stainless or any other steels we do make many ferro-alloys that give new properties to steel and improve its quality. Our metallurgical engineers have accumulated a vast amount of information on the various types of stainless steel. If you are interested in any of the many applications of stainless steel, write to us for further information.

BUY UNITED STATES WAR BONDS AND STAMPS

Stainless steel utensils, trays, scales, and fillers are used in this strawberry freezing plant.

In this egg freezing plant, stainless steel is used for churn, tanks, piping, and separators.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet
Trade Mark
Ferro-Alloys & Metals

Another Reason why PSF is CASTING HEADQUARTERS to Steel Producers

This blast furnace goggle valve is just one more of the long and complete list of mill equipment castings that PSF furnishes—not only to practically all of the industry's plants in this country, but to Allied Nations as well. There's long and valuable experience behind these castings, but even more important, they're the product of the most advanced foundry practice, testing methods and machining facilities. That means dependably, uniformly high *quality*—the first assurance you want in any casting purchase.

W&D 9599

46 YEARS OF STEEL CASTING KNOWLEDGE

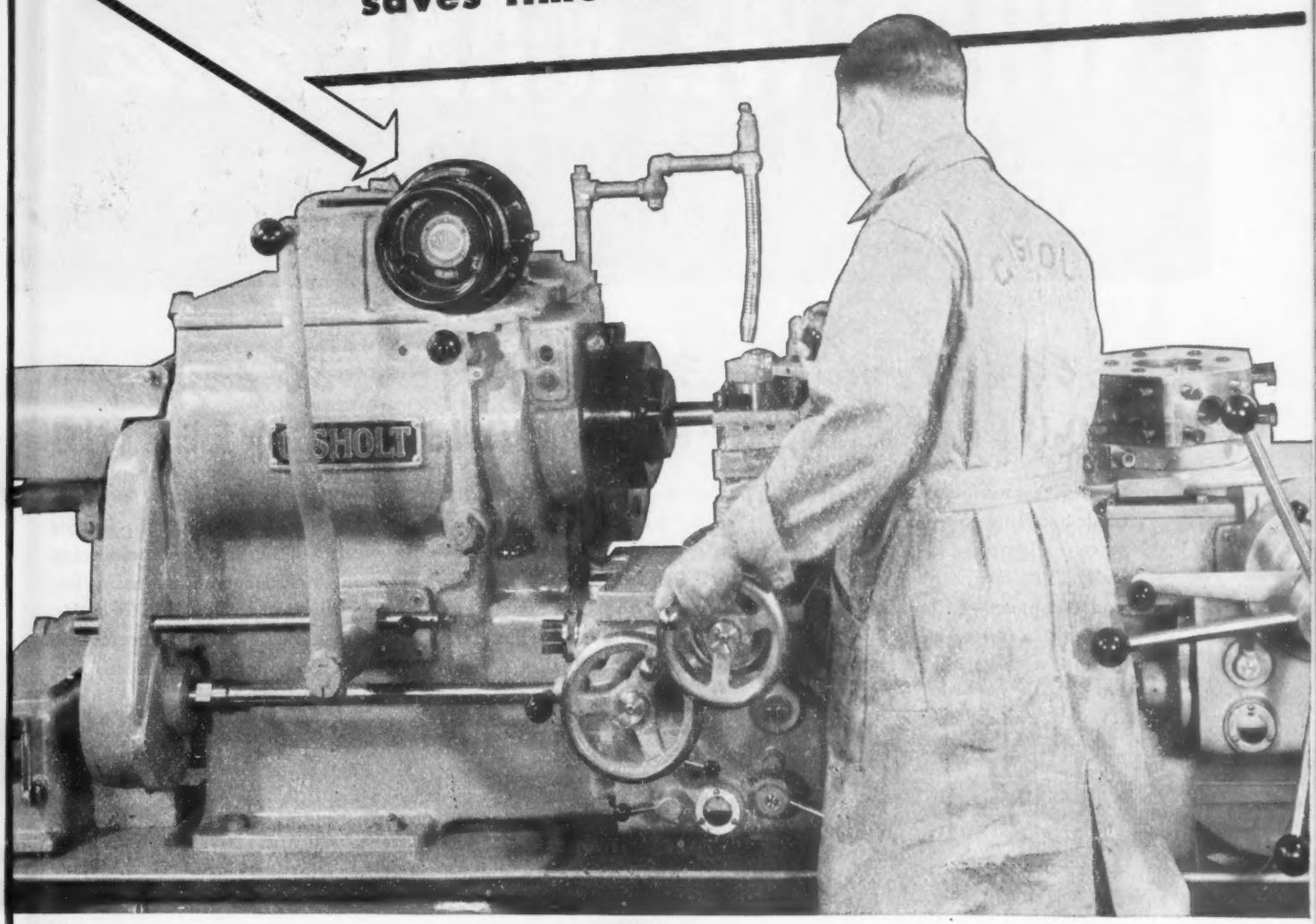
Pittsburgh

STEEL FOUNDRY CORPORATION

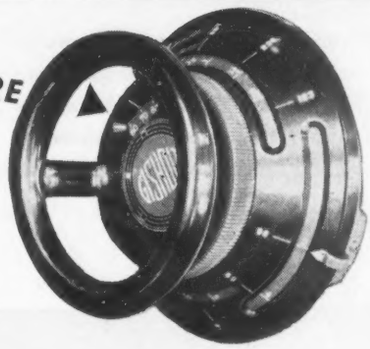
GLASSPORT, PA.

Sales Offices: NEW YORK • PHILADELPHIA • WASHINGTON AND CHICAGO

How the GISHOLT HYDRAULIC SPEED SELECTOR saves time and trouble . . .



SET CUTTING SPEED HERE



SELECT DIAMETERS HERE

There is a "best" cutting speed for machining with every combination of material and tool. Set that cutting speed here by turning the knurled ring.

The operator merely turns the handwheel to the diameter of each successive cut. The Selector automatically shifts to the proper spindle speed.

The Gisholt Speed Selector is power-operated. Actual shifts are made instantly to any one of 12 spindle speeds, making it easier for the operator always to use the most efficient cutting speed for the work at hand. There are no time-wasting calculations—no complicated adjustments. And no physical effort is required of the operator.

Actuated by a mere touch to the wheel, the Speed Selector functions automatically, leaving the operator free to index turret and present new tools to the work, eliminating the waste of operator time between cuts.

The Gisholt Speed Selector increases production—helps to improve the quality of machining work. Write for literature.

GISHOLT MACHINE COMPANY • *1217 East Washington Avenue, Madison 3, Wisconsin*
Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

GISHOLT

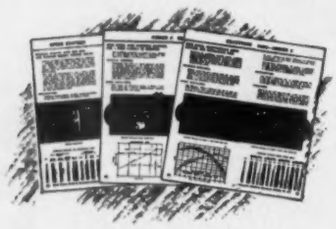
URRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

WHAT WE MAKE *and*

Valuable New Book Helps You DESIGN · SPECIFY · ORDER!

64 pages of EQUIPMENT

Consult this section to select the type of air handling equipment that will serve you better—and most economically. You'll find the Sturtevant line complete — from the tiniest blower to a fan standing thirty feet high. A wide variety of equipment



for every application is illustrated and described here, giving advantages, condensed construction features, dimensions, performance and capacity tables—equipment that stands for the ultimate in air engineering.

36 pages of APPLICATIONS

Leaf through these pages to find how "Air at Work" steps up efficiency of plants and processes. Typical examples show how air handling equipment that's properly engineered and installed purifies the air, heats or cools it, makes it wet or

dry, conveys, removes fog, fume or dust; burns coal, oil and gas *more efficiently*—in short, offers a means of mastering competition wherever men and machines operate.

80 pages of ENGINEERING

You'll have occasion to refer to this section again and again for its wealth of helpful air engineering data. Included here are many frequently used air laws and formulas, many tables and design shortcuts in more convenient, more usable form,

many charts and diagrams *never before available.* Every page, representing years of practical field and laboratory experience, will make a valuable addition to your Air Engineering library.

FOR PURCHASING AGENTS
A handy Index and cross reference chart shows you every piece of equipment Sturtevant makes, what each is used for and where to find it.
FOR OPERATING MEN
In this book you'll find the right air handling equipment — the right design data — for both new constructions and replacements.
FOR PLANT SUPERINTENDENTS
The fact-packed section on types, functions and advantages of equipment for "putting air to work" is a real production tool.
FOR ENGINEERS and ARCHITECTS
Your designing and specifying work will be greatly expedited by the authoritative material in the equipment and engineering sections.

How it is used

STURTEVANT CATALOG AND USEFUL AIR HANDLING DATA

WHAT WE MAKE

Help For You On All These Jobs

- Industrial Air Conditioning
- Heating
- Ventilating
- Dust Removal
- Fume Control
- Pneumatic Conveying
- Vacuum Cleaning
- Auxiliary Motive Power
- Equipment and Machinery Cooling
- Mechanical Draft
- Industrial Drying
- Industrial Processing
- Dust and Fume Recovery
- Vapor Absorption
- High Temperature Air Handling

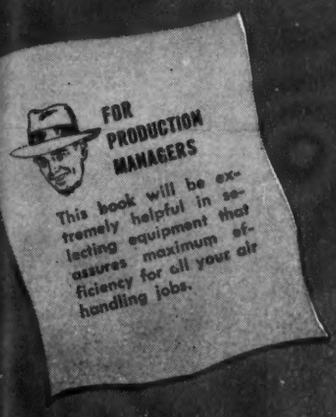
IT'S ALL UNDER ONE COVER — the essential information you need when you design, specify or order air handling and allied equipment or systems —as well as aid in choosing subjects on which you want detailed information or competent engineering help.

Due to paper restrictions, we must limit this first edition of "What We Make" to individuals who request it on their business letterhead. Any responsible person is invited to write for a copy — there is no charge or obligation. Please use the post office box address to expedite handling your request.

B. F. STURTEVANT COMPANY
P.O. Box 97 • Hyde Park, Boston 36, Mass.

Sturtevant
Puts Air to Work

STURTEVANT


FOR PRODUCTION MANAGERS
This book will be extremely helpful in selecting equipment that assures maximum efficiency for all your air handling jobs.

Sturtevant
REG. U.S. PAT. OFF.
Puts Air to Work

An Enameling Improvement ready *now!*

THE Titanium Alloy Manufacturing Company announces a new titanium alloy enameling steel which offers improved quality and reduced cost to the manufacturers of vitreous enameled products.

This new steel has exceptional ductility, being in this respect at least equal to the best deep drawing steels previously known. It also has superior resistance to sagging at enameling temperatures.

Tests conducted in many different laboratories have indicated that the use of titanium alloy enameling steel virtually eliminates primary boiling because of the fact that the carbon in the steel has been stabilized by the titanium. This indicates that ground coat can be eliminated, assuring greater uniformity of finished product and reducing rejects and re-operations very substantially. It permits furthermore the application of lighter coats of enamel with the consequent reduction in cost and improvement in appearance and wearing qualities of many enameled articles.

There are many additional features of interest to both steel producers and manufacturers of enameled products.

A member of our Technical Staff will be glad to go over details with you at your convenience. Send us a card for prompt action.

★ ★ ★

Pending patent applications on the new enameling process and product made thereby are owned jointly by Inland Steel Company and The Titanium Alloy Manufacturing Company under Trust Agreement.

THE TITANIUM ALLOY MANUFACTURING COMPANY

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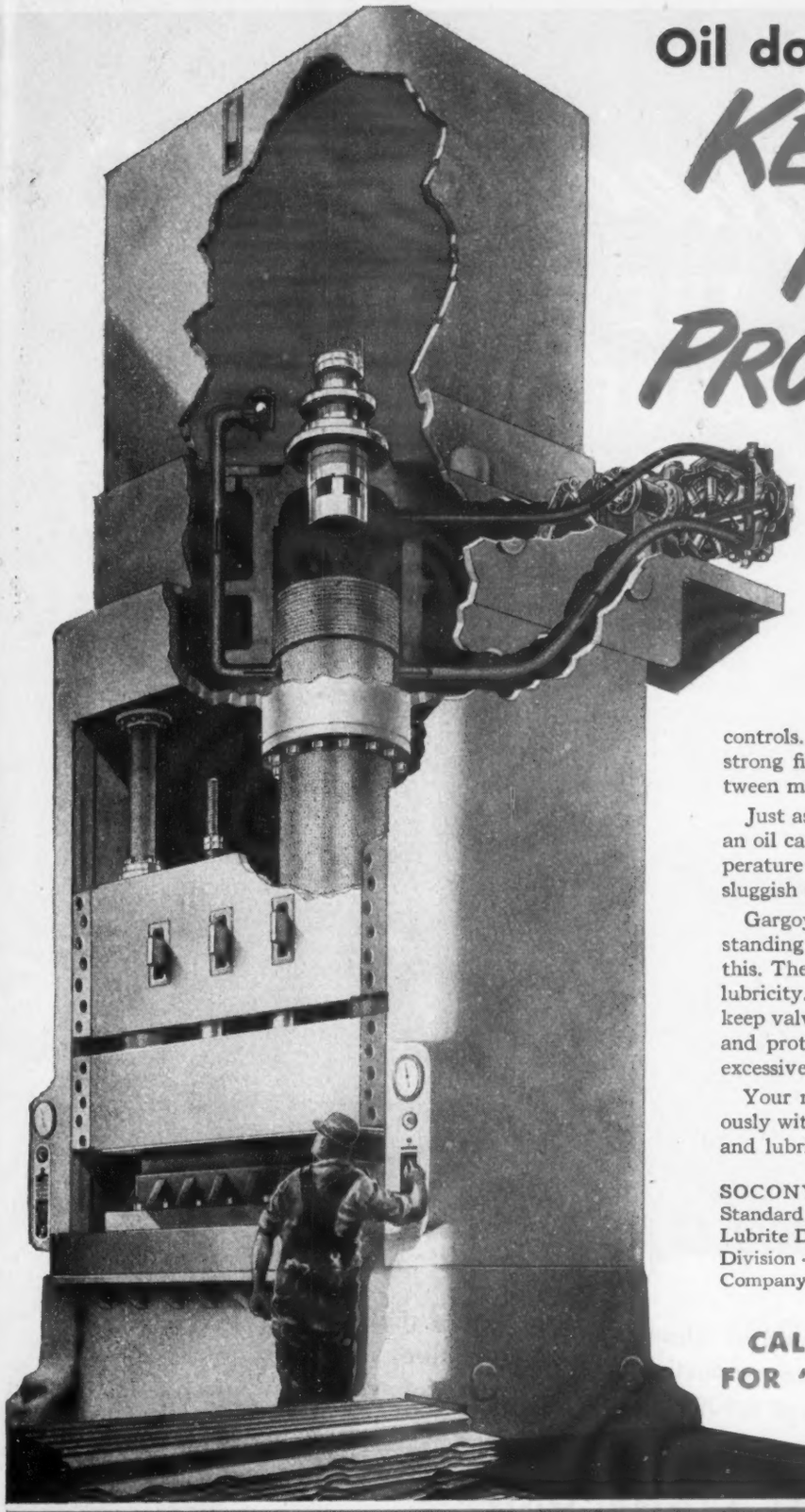

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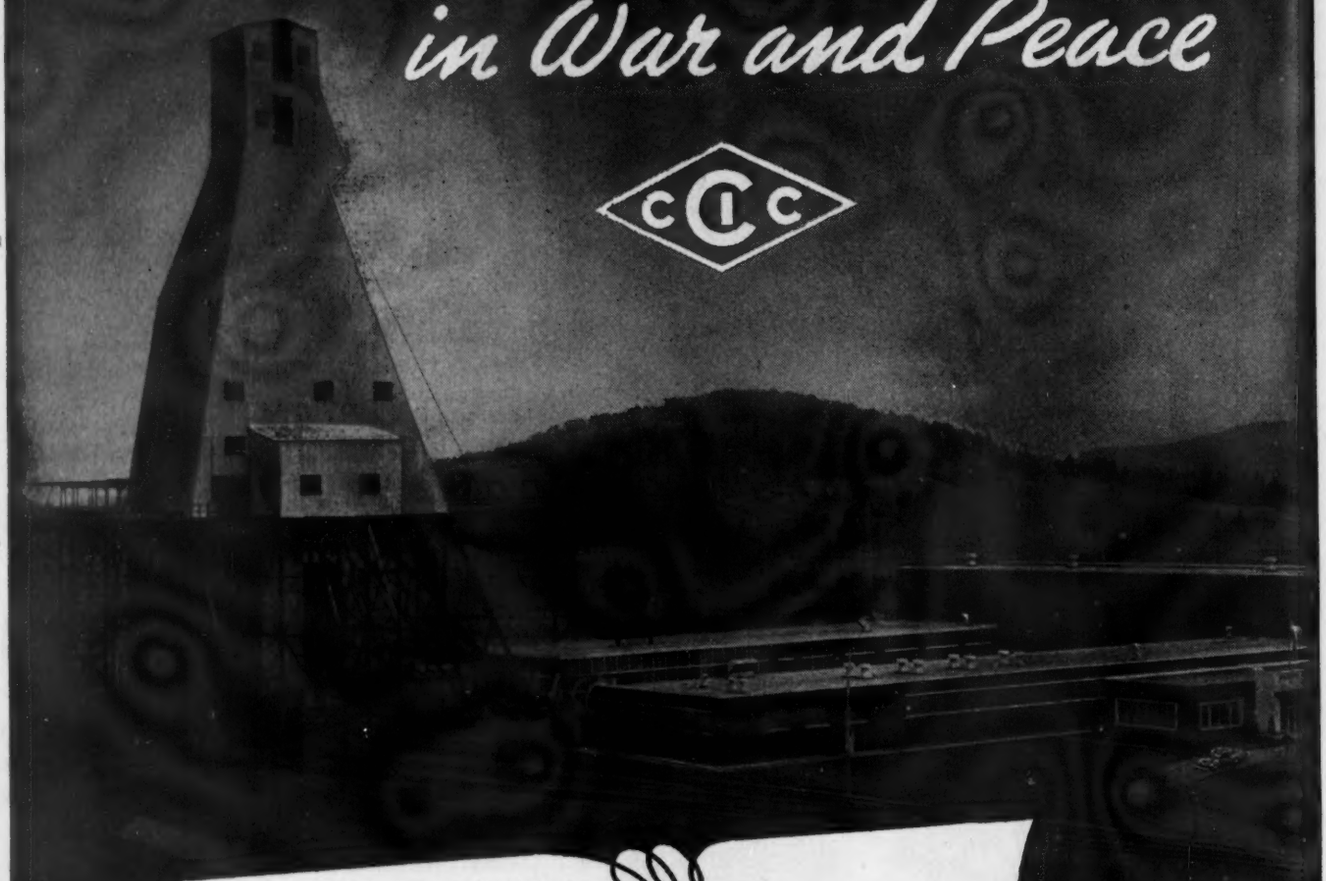

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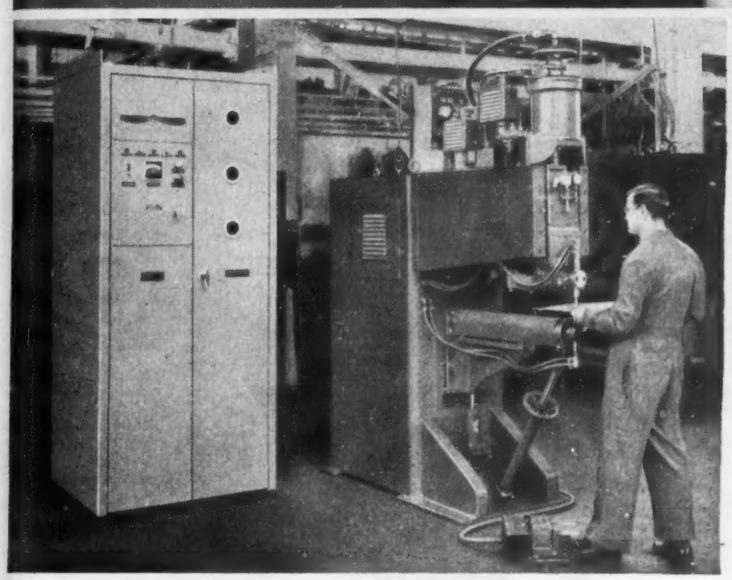

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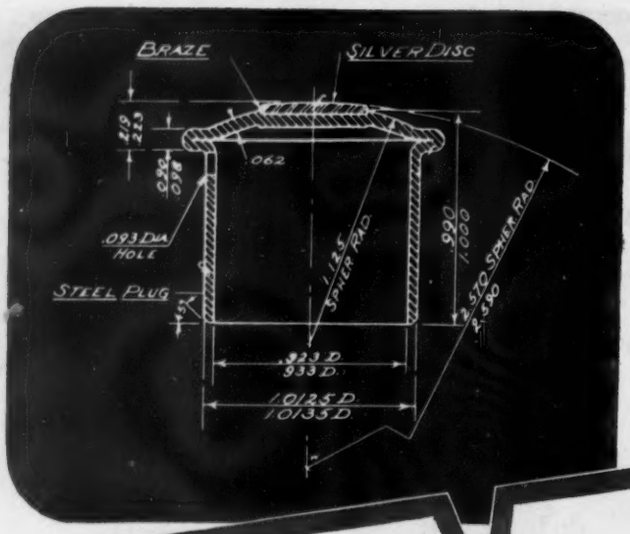
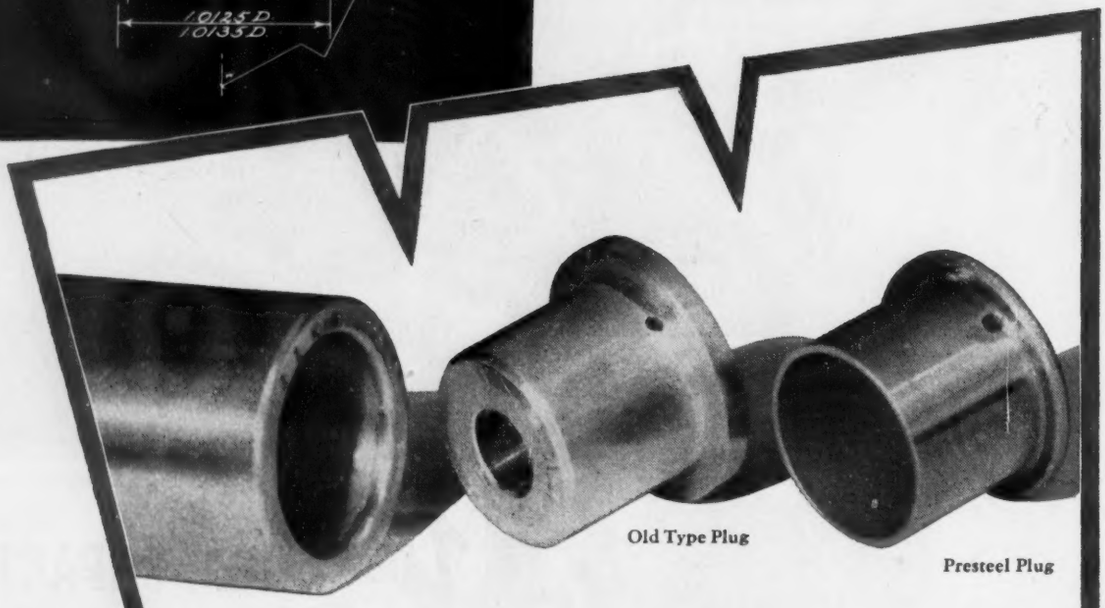


Detail Drawing of the Steel and Silver Plug



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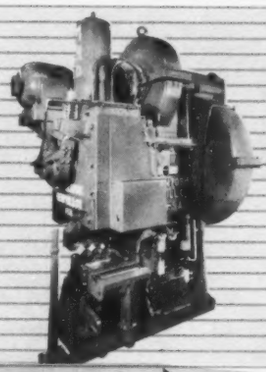

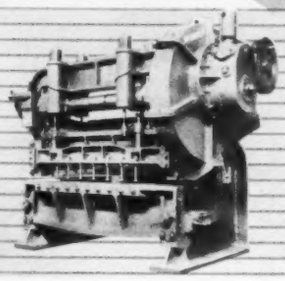

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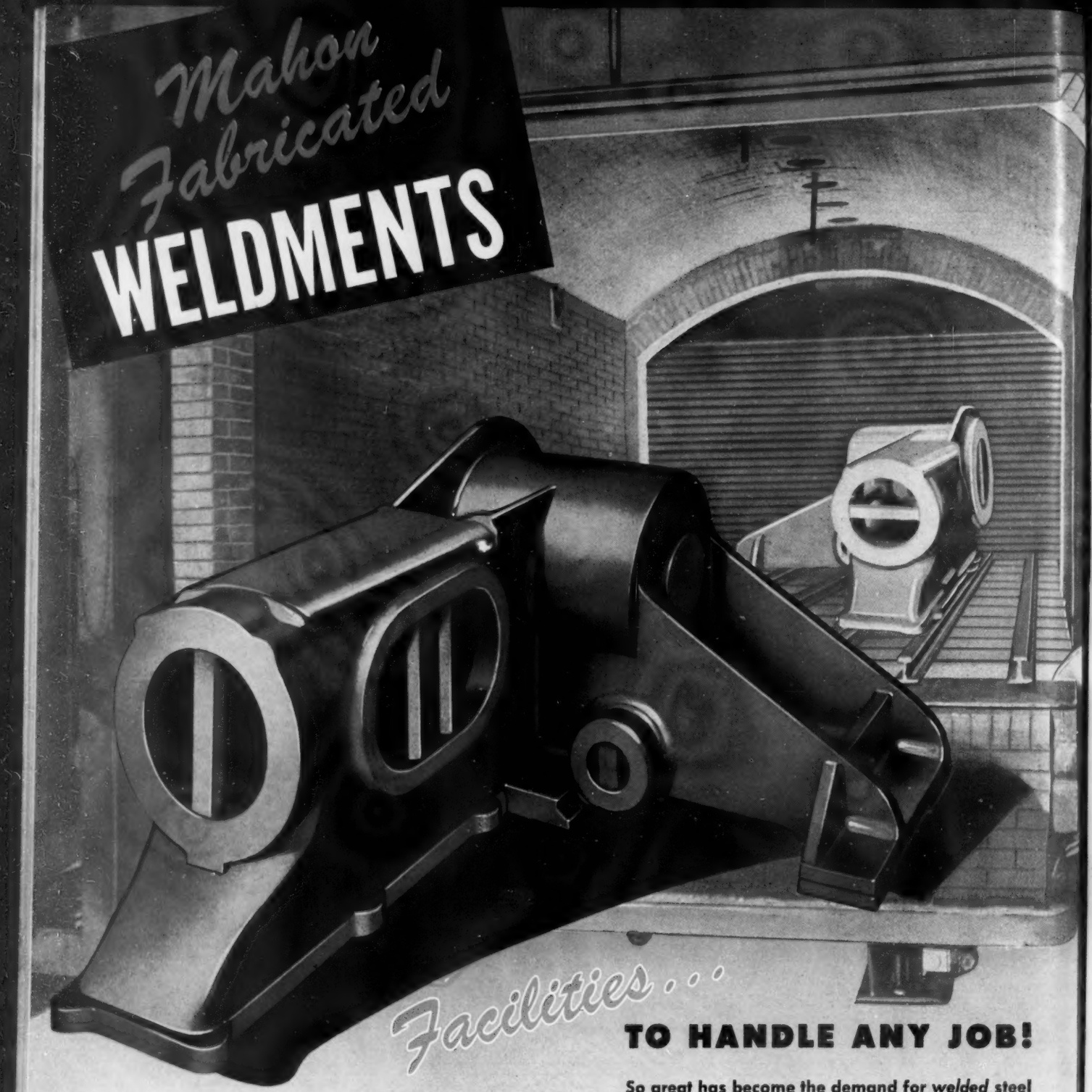

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Published by THE PENTON PUBLISHING CO., Penton Bldg., Cleveland 13, Ohio, E. L. SHANER, President and Treasurer; G. O. HAYS, Vice President and General Manager; R. C. JAENKE, Vice President; F. G. STEINEBACH, Vice President and Secretary; E. L. WERNER, Assistant Treasurer.

Member, Audit Bureau of Circulations; Associated Business Papers, Inc., and National Publishers' Association.

Published every Monday. Subscription in the United States and possessions, Canada, Mexico, Cuba, Central and South America, one year $6; two years $10; all other countries, one year $12. Single copies (current issues) 25c. Entered as second class matter at the postoffice at Cleveland, under the Act of March 3, 1879. Copyright 1945 by the Penton Publishing Co.

STEEL

The Magazine of Metalworking and Metalproducing

VOL. 116, No. 3 JANUARY 15, 1945

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STEEL
January 15, 1945

A Question of Morale

In his message to Congress on Jan. 6 the President asked for a more energetic war effort and emphasized more forcibly than on previous occasions the need of a national service act. On the whole, the reaction of the public to this part of the message has been favorable. The attitude reflected in the public press and in the statements of majority and minority leaders in Congress is that the people are prepared to do whatever is necessary to win the war quickly.

This does not mean that there is complete agreement as to means. Men and women who are sincere in their desire to go all-out for war are asking whether national service legislation, enacted at this time and superimposed upon the already complicated machinery for allocating manpower, will help or hinder attainment of the desired objectives. Their doubt arises from the feeling that past efforts to utilize manpower have not been consistent and that much of the waste in manpower now prevalent could be reduced substantially through the exercise of authority already granted the executive branch.

Considerable evidence supports these beliefs. Until now, nothing has been done to utilize in the war effort at home or abroad the 4,000,000 men who are classified as 4-F. Every citizen knows of men in the armed services and in government agencies who are discouraged because they are doing unimportant or even unnecessary work. They want to be useful but are "frozen" in futile jobs by red tape. Almost daily one hears charges that some employers are hoarding labor but, if it is true, little has been done about it. The latest report of WMC shows labor surpluses in New York, St. Louis, Memphis, Nashville and many other cities, yet until recently only half-hearted efforts had been made to place these surplus workers in war jobs.

War Mobilization Director Byrnes estimates the labor shortage at 300,000 persons. It would seem that this need can be supplied more easily and more quickly by plugging known manpower leaks than by waiting for the slow result of a national service act.

We believe that whether or not compulsory service is desired at this time should be decided, not on the basis of its immediate effect upon manpower shortages, but on the basis of its psychological influence upon the nation. This is the vital question: "Is the state of national morale such as to require this drastic action to win the war?"

PSYCHOLOGY IN WAR: Fate wields a powerful influence in the affairs of men. A brilliantly executed German counter-offensive coupled with a solid month of winter more severe than many sections have experienced since 1913 or earlier has provided the government with convincing arguments for cracking down on "business as usual." It is an odd commentary on human nature that this combination of man's miscalculations and an act of God has given the administration more courage to act decisively than it had been able to generate in 11 years of planned economy.

On the heels of Byrnes' ban on horse racing have come in rapid succession a plea for drafting 4-Fs and trained nurses, a virtual abandonment of conventions, a repudiation of ration coupons and a tightening of rationing, restrictions on the use of coal and more positive controls upon manpower. Probably these are only the initial steps in a program to persuade citizens to tighten their belts to the pinching point.

Industry's attitude toward this experiment in psychological warfare must be realistic. Will this crackdown help reduce absenteeism? Will it help re-

(OVER)

cruit needed labor? Will it increase efficiency in war production? Will it relieve pressure on overtaxed transportation and communication services?

Will it speed the hour of victory?

—pp. 43, 48, 51

• • •

"BUILDING UP" METAL: A Florida shipyard is employing the metallizing process for many uses. It is rebuilding worn copper switch fingers, building up worn machine shafts, metallizing the bores of cylinders, spraying parts where the heat of binding has injured the galvanized coating, spraying overwelded seams and metallizing bulkheads, fresh water tanks and other naval assemblies after fabrication.

These metallizing jobs range in size from those which can be done in a few minutes to work which involves the depositing of hundreds of pounds of metal and requires as much as 72 hours of continuous spraying. Types of wire employed include zinc, brass, copper and a number of carbon steels.

Most of these applications are on orthodox jobs which are to be found in thousands of shops in the metalworking industries. That this shipyard has found so many uses for metallizing makes one wonder whether industry generally is employing this process as widely as it should be. —p. 101

• • •

NAZI QUALITY IS UP: Speaking at the SAE meeting in Detroit last week, Col. J. H. Frye, from the office of Chief of Ordnance in Washington, appraised the quality of enemy war materials on the basis of analysis of captured materiel. In his opinion, the German product is good and is getting better while that of Japan is inferior and static.

Examination of captured German munitions shows good metallurgy, only mediocre forging technique due to poor die design and lack of adequate hammer capacity, excellent flame and induction hardening, good mechanical design and machining and finishing of high quality. Japan's materiel reflects no unusual engineering ability or originality.

Colonel Frye stated that Germany's steel producing capacity, once rated at 50,000,000 tons annually, has been cut to 35,000,000 tons by bombing, labor trouble and loss of territory. Japanese capacity, originally set at 15,000,000 tons, is believed to be down to 11,000,000 tons. —p. 46

STABILIZING SCRAP: It is encouraging to note that efforts are being made to profit from the lessons learned in the recent experience in iron and steel scrap. Readers will recall that last fall consumer demand for scrap dwindled almost to the vanishing point and that prices broke sharply below OPA ceilings. The turn in the war revived demand, cold weather and manpower shortages handicapped collections, and now industry faces a new drive to restore scrap supplies to safe levels.

With this experience in mind, Alex Miller of WPB told last week's meeting of the Institute of Scrap Iron and Steel that steel buyers now are being assured protection by Army Ordnance from loss on purchases made on war accounts.

In the same vein, Edwin C. Barringer, president of the institute, emphasized the speculative character of the scrap market and stated now is an opportune time to place the purchase of scrap on a more rational basis and to lay the groundwork for a more stable market in peacetime.

This is a praiseworthy objective. —p. 48

• • •

GRIEF-PROOF CARS: Surveys as to what automobile owners find wrong with their present cars and what they want in tomorrow's models gave motor car designers and engineers something to think about at last week's meeting of SAE. Perhaps it is no coincidence that some of the faults most heavily emphasized in the polls are those which are causing motorists most grief during the present spell of hazardous winter driving.

For instance, many car owners object to slanting windshields and almost horizontal rear windows. This complaint is pertinent now when few northern motorists have been able to see through their rear windows more than once or twice since Dec. 15. The public wants clear vision and lots of it.

Another peeve is flimsy bumpers. Owners vote for strong, less showy bumpers mounted at a standard height from the ground. They also want—and millions will applaud this—an honest-to-goodness wheel jack that will work.

There is a strong note of realism in the returns from these surveys. —P. 61

E. L. Shaner

EDITOR-IN-CHIEF

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Manpower supply in the principal eastern and midwestern industrial areas is depicted on this map, prepared by the War Manpower Commission. Note that areas where labor is plentiful exist only a few miles from critical areas

Doubt Super Crisis in Labor Supply

Management and labor cool toward proposal for national service legislation. Shortage of workers in critical war production programs believed to be around 300,000. Inventory of less essential jobs being taken by WMC. Employment ceilings may be imposed

DOES a super crisis in manpower really exist? Does the situation actually require a national service act? If enacted, would such legislation accomplish the desired ends?

These questions are puzzling management and labor, as well as Congress, today.

That a grave shortage of labor in critical war production programs exists, no one doubts. That more strict measures to prevent workers from leaving war jobs and to prevent unwarranted absenteeism and tardiness are necessary, no one doubts. That measures to curb wartime strikes should be taken, no one doubts.

Admitting the manpower crisis, management and labor are inclined to discount the hullabaloo emanating from Washington. They believe the present crisis is on par with other emergencies that have been faced—and conquered—during the war. In mining copper, in producing small arms ammunition, in building Liberty ships and in constructing landing craft, manpower shortages have arisen; the problems soon were solved.

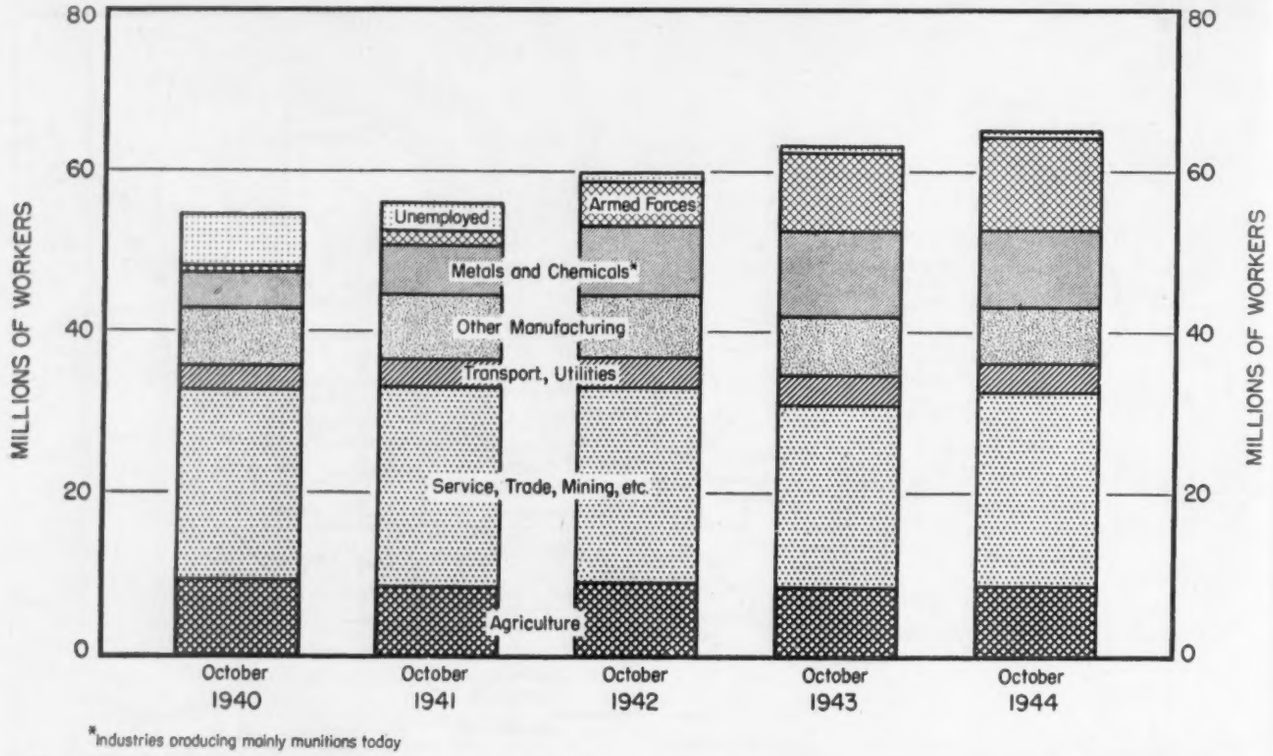
A national service act, which many desired in the early stages of the war, would be difficult to enforce and would only add another bureau to the top-heavy number already in existence.

The President's call for such legislation and the orders of James F. Byrnes, director of War Mobilization and Reconversion, tightening up on selective service deferments and otherwise imposing more strict manpower controls, are viewed as being partially in the nature of "psychological warfare."

Two or three hundred thousand workers placed in the right places at the right time and held there at least until V-E Day would fulfill the needs of critical war production. The various government agencies are not in close agreement as to the number needed. Mr. Byrnes, in his recent report to the President and Congress, placed the figure at 300,000. This would not appear to be a large number to recruit when one considers the total labor force is nearly 65,000,000. However, as Mr. Byrnes points out, there no longer is an unemployed group available for recruiting prospects. Main sources of labor for the critical programs must be:

1. New workers just entering the civilian labor market.
2. Workers in relatively less essential occupations who may be transferred to war industries.
3. Workers leaving plants where munitions contracts have been cut back.

A look at the accompanying manpower map reveals the shortages are



Shifts in employment are indicated in chart above. The total labor force has increased from 54.5 million in 1940 to 64.8 million at present. Greatest increases have been in the armed forces and in the metals and chemical industries

spotty. In Pennsylvania, for example, labor is plentiful at Scranton, Altoona and Johnstown. It is critical in Philadelphia, Pittsburgh, Erie, Harrisburg and Allentown. The same spotty situation exists in New England and other areas.

Combing the plentiful areas for workers who are willing to transfer to the critical districts is a possible solution to the problem and one in which the War Manpower Commission now is engaged. Inventories are being taken of the less essential jobs and the WMC is prepared to impose employment ceilings on the less essential industries to release workers for war production.

A survey by STEEL's editors in leading war production centers reveals the following conditions:

Requirements in the Detroit area are not nearly as critical as in other areas where labor turnover has been precipitated by premature talk of reconversion. E. L. Cushman, director of the Detroit WMC office, estimates total needs will be 27,000, with most of these in the skilled classifications. Immediate needs, however, can be measured in the hundreds.

While labor turnover is not a pressing problem in the Detroit area, the problem of absenteeism is serious. One foundry with a working force of 600 reported in the final week of last year that a total of 48 men failed to show up for work at all. After the New Year's holiday absenteeism ran from 20 to 30 per cent in some large plants.

Prevailing sentiment among both management and labor in the motor capital is against national service legislation for the principal reason it would be difficult to enforce and would only add another bureau to the top-heavy number now in existence.

The Buffalo area continues one of the tightest labor markets with about 20 plants falling behind on top urgency war production. Thirteen hundred workers are needed immediately by plants working on critical orders.

Current requirements of the critical industries in the Pittsburgh area now total about 3000 workers. In addition, the small arms program, now in the formative stages, will require 1000 more workers.

Pittsburgh's manpower shortage stems largely from the expanded heavy-caliber shell program and a substantial number of workers are needed in steelworks and rolling mills.

Pittsburgh Adopts New Plan

To supply these workers, plus an additional number required to fill the gaps created by quits, transfers and selective service withdrawals, the district labor-management committee has endorsed a new plan to shift workers from non-essential to essential jobs. This plan includes an inventory of the less essential industries and the placing, if necessary, of employment ceilings on those industries to channel workers into war production.

United States Employment Service offices in the New York area noted a spurt in applications for war work following the announcement of more strict government controls on manpower and a general public recognition of the war job yet to be done. During the first days of January applications for war work increased 55 per cent over the comparable period in December of last year.

Needs for manpower of the 1164 plants reported to the WMC in the New York area will mount to 73,000 additional workers by March.

Newark, N. J., area reports an acute labor shortage which is expected to become worse over the next several months. "Work or fight" regulations now proposed are resulting in some shift to war industries, but the heavy increase in the district's munitions program is expected to cause labor requirements to mount more rapidly than transfers. An estimated shortage of 16,000 exists now. Two months hence this may exceed 25,000. Greatest stringency is in unskilled labor, where requirements are 60 to 70 per cent of the total. Plants in greatest need of more workers include foundries, manufacturers of aircraft engines and parts, ammunition, rocket bombs, radar, trucks and shipyards.

Manpower requirements have jumped sharply in the critical labor area of Philadelphia, which includes Camden, N. J., and five surrounding counties. These requirements now are estimated at 24,000, compared with 12,000 last November. Indications point to little relief during the next several months as needs still are growing and may offset measures now being taken to channel non-essential workers into war production. Foundries and forge shops top the list in the urgency of their needs although shipyards and government establishments are not far behind. Most district steel mills are running along a fairly even keel although there are tight labor spots here also. Sixty-five per cent of the workers needed are for unskilled jobs.

Chicago USES offices recently have been crowded by men seeking "must" production jobs and officials hope the area's manpower shortage may be on the way to solution. On Jan. 8, following Mr. Byrnes' "work or fight" statement, Chicago's USES offices reported a heavy increase in male registrants for war work, some handling double the normal number of applicants. A large percentage of these was 4-Fs.

Dean William H. Spencer, Chicago regional WMC director, said passage of legislation making 4-Fs available would go a long way toward supplying the 15,000 to 20,000 people needed immediately in the area's critical war plants. By Feb. 1 a total of 55,000 workers will be needed in the area's "must" plants.

WMC has started an inventory of workers in Chicago's 700 major war plants as part of a campaign to find the 15,000 skilled workers for vacancies for 50 high-priority establishments.

All steel mills in the Chicago district are in need of more workers and in recent weeks have had little success beyond holding their own. Manpower, rather than lack of capacity, has limited output of rolled products, particularly hot-rolled and galvanized sheets.

High absenteeism and labor turnover continues to prevent most metalworking companies in Cleveland district from meeting expanding production schedules. Serious manpower shortage exists in a number of key plants here as a result of the revision upward of schedules, but the situation would be automatically rectified in most instances if the quit and absenteeism rate could be reduced.

To meet the increased manpower needs the WPB and WMC are co-operating more closely and are combining their respective sanctions to force compliance with regulations on less essential activities. Cleveland steel producers say men are needed urgently in coke oven, blast furnace, open-hearth and shipping departments, but the most critical requirements now are in the finishing mills.

Fear Shortage of Lake Seamen

Great Lakes vessel operators fear a critical shortage of seamen to man the ore carriers when navigation opens this spring. Recent publicity aimed at recruiting men for the maritime service already has drawn many lake seamen to ocean vessels.

In Birmingham the labor shortage has grown exceedingly tight and the local labor-management committee has asked the help of public officials in enacting more stringent vagrancy laws, to question loiterers in pool rooms and taverns, and to tighten up generally over the "work or fight" policy.

Absenteeism continues the area's gravest problem and the committee has asked foremen and supervisors to keep their men constantly reminded of the importance of fulltime work.

Arrangements are being made with the Internal Revenue Department to aid in the filling out of workers' income tax returns to avoid man-hours lost from that cause.

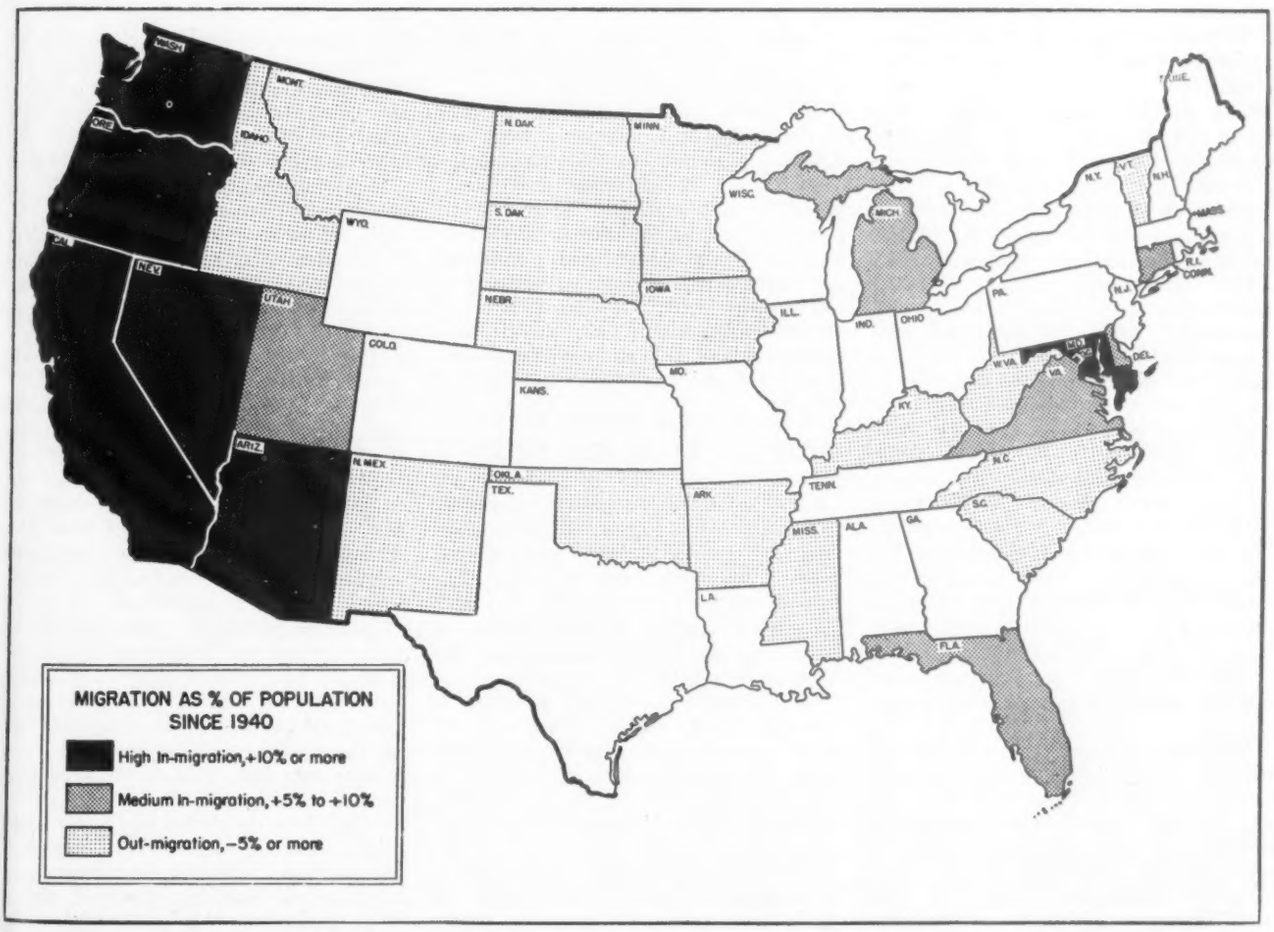
About 2000 more men are needed in coal mines in the southern district and miners who have accepted employment in other industries will be referred back to the mines whenever possible.

Boston WMC officials have undertaken an inventory of less essential jobs to direct any excess workers into war jobs. Shortages in labor are held responsible for 155 companies in this area being behind on critical war production programs.

While WMC officials hope the inventory will cause a voluntary transfer of workers to more essential jobs, they are ready to slap employment ceilings on the less essential industries if necessary.

As an example of how the program will work, one official said that if a less urgent employer had 22 toolmakers and the WMC needed ten, that employer's ceiling would be set at 12 toolmakers.

Dislocations resulting from earlier revisions in war production schedules growing out of an "on and off" policy of some of the services are blamed for many shortages.



Migration of workers since 1940 is depicted on this map. Greatest movement has been to the shipbuilding and aircraft centers on the West Coast. Greatest outmigration has been from the midwestern farm states

War Engineering Chief Topic at Detroit Meeting

Three thousand automotive engineers attend last major conference until transportation emergency ends. Ordnance authority says German materiel is good and improving. Jap equipment is inferior

J. M. CRAWFORD
Elected president of SAE

By GUY HUBBARD
Machine Tool Editor, STEEL

DETROIT

THROUGHOUT the week of Jan. 8 convention facilities at the Book Cadillac hotel were devoted entirely to the needs of more than 3000 members and guests of the Society of Automotive Engineers. This undoubtedly was one of the last of the major engineering meetings for the duration—a fact emphasized by the indefinite postponement of the national convention and exhibition which was to have been staged by the American Society of Tool Engineers in Cleveland in March.

That this SAE meeting was a "war engineering meeting" in fact as well as in name was attested to by the number of Army and Navy uniforms, of the United States and its Allies, which were in evidence—also by the nature of the program. For example, no less than 25 papers dealt with aviation subjects, including helicopters and their design. Incidentally, ample evidence was presented that these direct lift machines have "arrived" as real working members of the aircraft family. The same is true of jet propulsion.

This last was emphasized by Brig. Gen. F. O. Carroll, chief, Engineering Division, Air Technical Service Command, Wright Field, O. General Carroll was the principal speaker at the SAE banquet, on which occasion the Daniel Guggenheim Medal for 1944 was presented to Lawrence D. Bell, president, Bell Aircraft Corp., Buffalo, whose jet propelled planes were shown in action by means of colored motion pictures.

My primary impression was that regardless of the extent to which automotive production may be "frozen" as far as civilian vehicles are concerned, engineering and production thinking and practice never was in any more "liquid" condition than is the case today. Strictures as of the moment toward anything smacking of postwar planning did not deter the new president of the Society, J. M. Crawford, chief engineer, Chevrolet Division, General Motors Corp., from promising with emphasis that the important postwar program launched by retiring president W. S. James, chief engineer, Studebaker Corp., South Bend, Ind., in behalf of SAE will be carried on. This will include grooming of SAE for maximum effectiveness during the critical days of conversion to peacetime production.

The spirit of the meeting itself was, in the words of Mr. James, "First and foremost, dissemination of technical information on vastly improved methods, processes and materials wherewith to meet war production demands, despite shortage of critical materials, time and manpower. Much which develops from this meeting will be reflected in more effective armored vehicles, aircraft, ammunition, guns and other war essentials for United Nations' armed forces."

Steel More Than Holding Its Own

Steel as a constructional material is holding its own "and then some," according to E. P. Strothman, engineering consultant, A. O. Smith Corp. He cited the case of the B-29 bomber nose frame. Originally cast in magnesium, this demanded use of 3000 to 5000 pounds of sand to produce something weighing only 38 pounds finished. Delivery dates could not be met.

By substituting a welded structure of low-alloy steel, delivery dates now are being met with a cheaper frame of eight times the yield strength. Not being a metallurgist, I will not discuss the metallurgical matters involved, but as a machine tool man I do want to compliment A. O. Smith Corp. on the tooling involved in shaping the parts of this frame and in locating and holding them during flash welding. I want to echo what Mr. Strothman said to the effect that machine men must now look to their laurels because of rapid development in fabrication of metals by methods other than by cutting. Let me mention, for instance, that hollow steel propeller blades now are being brought to exact size and shape by "blowing" them within a die or mold, much as a glass bottle is blown.

While on the subject of metals let us consider for a moment what Col. J. H. Frye, Office of the Chief of Ordnance, Washington, had to say about enemy materials. In a paper based on analysis of captured materiel, Colonel Frye concluded that Nazi materiel is good and is getting better, while that of the Japanese is inferior and static.

According to the colonel, Nazi steel producing capacity is second only to that of the United States, even though the peak of 50 million tons yearly now has been cut to 35 million by bombing, labor difficulties and loss of resources through invasion. Japanese capacity—originally set at 15 million tons yearly—now is down to 11 million.

From numerous illustrations shown by Colonel Frye, my impression is that the Germans are far better metallurgists than they are forgers. The amount of metal which they have machined off crankshafts, etc. (as indicated by the cutting into flow-lines), is far more than would be tolerated here in the United States. Poor die design and lack of adequate hammer capacity is indicated. Flame and induction hardening, machining and finishing, however, are of high quality, as also is mechanical design of parts. The Japanese stuff definitely is "not so hot." Designs are poor copies of ours and machine shop work

is not good. As the colonel put it: "The Japanese are showing no engineering ability or originality beyond that commonly expected of them."

Induction heating came in for lively discussion by Howard E. Somes, chief engineer, Budd Induction Heating Inc., and H. B. Osborn Jr., research director, Tocco Division, Ohio Crankshaft Co., Cleveland. Mr. Somes devoted much attention to bore hardening. Some of the automatic setups for holding, heating and quenching, which he showed, are of a high order of merit from the tooling point-of-view. Sections of the work also revealed excellent performance at remarkable speed.

Dr. Osborn dealt optimistically with numerous jobs, but he did point out that the teeth of fine pitch gears still present problems. As far as coarse teeth are concerned, however, he showed ample evidence of successful contour hardening. His slides also showed interesting developments on long work—including bar stock—which is drawn through the units. While induction hardening machines have to a considerable degree been standardized, their setup for handling specific jobs requires careful study in every instance.

Among developments in actual automotive design which will affect vehicles of the future, power steering and multiple power plants came in for discussion.

Francis W. Davis, consulting engineer, Waltham, Mass., mentioned that any increasing number and variety of big, heavy duty vehicles having very large front axle loads, make manual steering increasingly difficult. Use of power steering on various military vehicles, points to its applications to trucks, buses, tractors and off-the-road vehicles. There is nothing at all "futuristic" about this. Several very successful systems already are available, including Bendix and Saginaw-Bendix.

Multiple power plants are an old story to Frank Fageol, president, Twin Coach Co., Kent, O. He pointed out that buses equipped with dual engines are relatively as agile as passenger cars—as they should be to keep pace with modern highway traffic. He showed evidence that two small engines satisfy limited space conditions and permit lighter structure throughout a vehicle. Ralph M. Werner, United Parcel Service, cited cost savings as high as 50 per cent with dual engines, together with saving in weight and cutting of road failures. He illustrated his talk with colored moving pictures showing a remarkable climb of Pike's Peak by a loaded Chevrolet tractor-trailer combination equipped with a Clark automatic booster engine unit.

Among many things which may affect automobile as well as aircraft engine design, is alcohol-water injection as an antidetonator. A. T. Colwell, vice president, Thompson Products Inc., Cleveland, presented a joint paper with R. E. Cummings and D. E. Anderson of his company, telling of practical experiments in getting peak performance by injecting at the point where knocking ordinarily begins. He did not try to explain the theory to any great degree but he did show a simple device which produces desirable results. This seems to be one of those instances where accomplishment comes first and explanations afterward.

Present, Past and Pending

■ WEINSTEIN APPEALS FOR CO-OPERATION OF SCRAP INTERESTS

CHICAGO—Harold Weirstein, Calumet Iron & Supply Co., East Chicago, Ind., has appealed for co-operation between auto wreckers, scrap dealers and others interested in the salvage industry to keep raw materials moving to steel mills, in addressing the National Auto Wreckers Association.

■ PULLMAN-STANDARD TRIPLES OUTPUT OF TRENCH MORTARS

HAMMOND, IND.—Pullman-Standard Car Mfg. Co.'s production of 81-millimeter trench mortars in December was three times average monthly production maintained during the first 11 months of 1944. A new shell-forging line for manufacture of 5-inch Navy antiaircraft shells has been placed in operation this month.

■ DEFENSE SUPPLIES CORP. EXPENDITURES PASS $10 BILLION

WASHINGTON—Reconstruction Finance Corp., through Defense Supplies Corp., has authorized expenditures totaling $10,350 million, of which $800 million have been canceled or assumed by private industry.

■ GENERAL ELECTRIC PLANS POSTWAR PLANT IN ASHTABULA

BRIDGEPORT, CONN.—General Electric Co. has exercised options on about 100 acres of land in Ashtabula, O., to erect a postwar plant costing between $4 million and $5 million for the manufacture of refrigeration units.

■ ALLIS-CHALMERS RESUMES TRIBUTES TO INDUSTRIES

MILWAUKEE—Allis-Chalmers Mfg. Co. will honor management and labor of the coal industry on Jan. 27 in the first of seven intermission features on their weekly broadcasts of the Boston symphony orchestra. Other industries scheduled for tribute in the 1945 season are marine, railroad, processed foods, textile, automotive and aircraft.

■ BUS AND TRAILER CONSTRUCTION PROGRAM APPROVED

WASHINGTON—Authorization of construction of 8833 integral buses to meet essential passenger transportation needs during 1945, compared with estimated requirements of 10,000, has been announced by ODT, following a program determination made by WPB. Construction of 19,304 commercial trailers and 2961 third axles has also been approved.

■ TEAMSTERS ADVOCATE REPEAL OF WAGNER LABOR ACT

CHICAGO—International Teamsters Union, AFL, headed by Daniel J. Tobin, advocates repeal of the Wagner Labor Relations act and abolition of the National Labor Relations Board.

■ U. S. STEEL EMPLOYMENT OF WOMEN RISES TO 40,000

CHICAGO—United States Steel Corp. and its subsidiaries now employ 40,000 women workers, of which 25,000 are directly engaged in war production and 15,000 in office occupations.

■ BETHLEHEM STEEL SEEKS PRICE SUIT PARTICULARS

TRENTON, N. J.—Bethlehem Steel Co. reported last week that it would apply Jan. 13 to Federal Judge Phillip Forman in United States District court for a bill of particulars on an indictment charging it and 17 other companies with unlawfully fixing noncompetitive prices for stainless steel.

Steel Corp. Shipments Set Record in 1944

Shipments of finished steel products by the United States Steel Corp. in December totaled 1,767,600 net tons, an increase of 23,847 tons over November and of 47,976 tons over December, 1943.

For all of 1944, shipments were 21,150,788 tons before year-end adjustments, compared with 20,147,616 tons after adjustment in 1943. Shipments for the year 1944 were the highest on record.

(Inter-company shipments not included)
Net Tons

	1944	1943	1942	1941
Jan.	1,730,787	1,658,992	1,738,893	1,682,454
Feb.	1,755,772	1,691,592	1,616,587	1,548,451
Mar.	1,874,795	1,772,397	1,780,938	1,720,366
Apr.	1,756,797	1,630,828	1,758,894	1,687,674
May	1,776,934	1,706,543	1,834,127	1,745,295
June	1,737,769	1,552,663	1,774,068	1,668,637
July	1,754,525	1,660,762	1,765,749	1,666,667
Aug.	1,743,485	1,704,289	1,788,650	1,753,665
Sept.	1,733,602	1,664,577	1,703,570	1,664,227
Oct.	1,774,969	1,794,968	1,787,501	1,851,279
Nov.	1,743,753	1,660,594	1,665,545	1,624,186
Dec.	1,767,600	1,719,624	1,849,635	1,846,036
Total	21,150,788	20,244,830	21,064,157	20,458,937
Adjustment		*97,214	*449,020	*42,333
Total		20,147,616	20,615,137	20,416,604

*Decrease.

Industry Urged To Maintain Full Efforts To Collect, Process Scrap

Dealers at convention told they face biggest job since 1941. New series of collection campaigns under consideration. Turn in the war has entirely changed supply picture. Purchasers to be protected against termination losses

URGENT plea to the scrap industry to maintain its 100 per cent effort in generating material for war production was voiced by numerous spokesmen for various government agencies, including the Army and Navy, at the seventeenth annual convention and war scrap forum of the Institute of Scrap Iron and Steel at Cincinnati, Jan. 10-11.

Indicative of the increased pressure of war procurement agencies for scrap was the announcement by W. Thomas Hoyt, director, Salvage Division, War Production Board, that consideration is being given the launching of a new series of scrap drives. Also, Mr. Hoyt said, arrangements have been made to enable scrap dealers to obtain more gasoline for their trucks with which to move termination scrap accumulating in war plants.

Critical turn in the war has entirely changed the scrap supply picture, convention delegates were told. What appeared to be a comfortable situation only a relatively few weeks ago has been transformed into threat of a definite and serious shortage before the end of winter. Unusually severe weather and continuing shortages of manpower are hampering collection, handling and shipping of scrap at a time when demand is mounting.

Biggest Job Since 1941

The increased need for scrap is putting an increasingly heavy burden on government procurement agencies, Alex Miller, chief, Raw Materials Branch, Steel Division, WPB said. He declared the job confronting industry today is the biggest since 1941 and that with the possibility of a coal shortage and resulting curtailment in pig iron production, stee'makers may be compelled to increase their open hearth scrap charges if they are to maintain ingot production near capacity.

Consumers' inventories of scrap are down sharply but stocks in dealers' yards are up, Mr. Miller said, urging the scrap men to do everything possible to move their stocks to the steel furnaces despite the bad weather and labor shortage.

Alluding to the withdrawal of the steel mills from the scrap market last fall for fear of being caught with large high-priced inventories should the war end suddenly, Mr. Miller said buyers now are being assured protection from loss on purchases on war account by Army Ordnance. This, he said, should remove most buyers' fears and eliminate the possibility of a sharp break in the market such as was experienced last fall.

The two-day meeting was highlighted by addresses by 15 representatives of the various government agencies and the Army and Navy. Chief topic of these speakers concerned the disposal of termination scrap and war surpluses.

Speaking for the Navy, Rear Adm. H. L. Merring said scrap and surplus materials must be kept moving to keep war plants clear for the tremendous production job still to be done. He said the Navy's cutbacks in production after V-E Day will be small. However, changes in design and armament needs can be expected right along resulting in much termination scrap which must be moved promptly from affected plants. The scrap dealers, he said, are being counted on to channel most of this terminated scrap back to the furnaces with the utmost dispatch.

RFC To Expand Sales Organization

As chairman of Reconstruction Finance Corp. and president of the Metals Reserve Co., Charles B. Henderson described the job RFC is doing in disposing of surplus materials through its various agencies. Lt. Col. Joseph Woodlock, Surplus Property Division, RFC, detailed policy of the organization. He said this government agency's duties will have to be expanded from one concerned with loans and banking and the procurement of critical war materials to a sales organization geared up to feed those surpluses back into war production and the essential civilian economy. Sales offices will be set up at strategic points throughout the country since RFC is not going to wait for the market to come to it, though it will seek to return material to consumption through established trade channels except where such is impracticable.

EDWIN C. BARRINGER

CHARLES R. HOOK

Another representative of RFC, Maj. Harvey J. Gunderson of MRC, pointed out that so-called surpluses are not surpluses in the true sense of the word. He described the RFC program as a redistribution program rather than a surplus property disposal undertaking.

Henry W. Cornell Jr., vice president, MRC, told the convention RFC surplus steel and metals will be sold through dealers, though some selling of scrap direct to the mills also is to be expected under allocation orders.

Speaking for the Air Technical Service Command, Army Air Forces, Col. E. W. Rawling said it is essential that plants with terminated contracts due to changes in material design be cleared as quickly as possible of scrap and surplus materials. He cited one instance where a plant was cleared in 30 days and work started on new models. Representing Army Ordnance, Lt. Col. Lowell Thomas complimented the scrap men on the excellent job they have done throughout the war and he urged them to even greater efforts in the days ahead. He asked that scrap dealers bid actively on the various government scrap offers when they come out.

Ceiling Prices To Be Maintained

Bulk of scrap from shipyards is being generated through the normal wastage of production and not through terminated contracts, said J. L. Vassar, Maritime Commission, explaining the commission's role in surplus property disposal. Ceiling prices on scrap will be maintained at least for the duration, Warren M. Huff, Iron & Steel Branch, Office of Price Administration, told the meeting. He said control must be maintained at approximately the level now in effect. However, the schedule will be adjusted to conform with conditions in the market, and the speaker cited the changes made in the schedule last fall when a change from a sellers' to a buyers' market forced prices below government ceilings. In Mr. Huff's opinion the long-term outlook for scrap is bright but he warned the industry must im-

prove its segregation practice so as to make material offered 100 per cent acceptable to the steel mills.

The steel industry has little to fear in the way of competition from the light metals and plastics in the postwar world, L. S. Hamaker, Republic Steel Corp., told the convention. He cited the advantages and disadvantages of the various metals as structural materials and pointed out that from a tonnage standpoint steel far surpasses that of any other metal or material. He thought copper and other nonferrous metals would feel the impact of competition from aluminum and magnesium far more than steel. The speaker was optimistic for the postwar steel market, citing the tremendous accumulated demand for civilian goods. He felt, however, there will be an excess steelmaking capacity after the war due to wartime-expansion and that much obsolete equipment will have to be scrapped with a highly competitive situation prevailing in the steel market.

Cites Urgent Need for Data

Thomas H. Miller, chief, Metal Economics Division, Bureau of Mines, asked the scrap men to continue sending in their reports, emphasizing the urgent need for data submitted in promoting the war program and establishing the basis for a stable peacetime economy.

At the business session on Thursday, Jan. 11, Edwin C. Barringer, president of the institute, in his annual address pointed out that since Pearl Harbor approximately 163 million tons of scrap have been consumed, nearly half of it open-market or dealer scrap. He urged a more rational buying policy on the part of scrap consumers, stating that of all the major raw materials scrap is the only one remaining on an irregular, unstable, speculative basis. He thought that now with the steel mills and foundries likely to be called on for capacity or near capacity operations through at least the next six months, it would seem the time were opportune not only to rationalize buying in the interest of the war effort, but also to lay the groundwork for a more stable market in peacetime.

Charles R. Hook, president, American Rolling Mill Co., was the chief speaker at the annual banquet.

Dwindling Inventories Threaten Steel Output

Declining steel scrap stocks are placing the steel industry in a precarious position toward meeting expanding war requirements.

Iron and steel scrap inventories are approaching the extremely low level recorded during the summer of 1942, and there is little indication that this downward trend will be reversed until the early spring months.

Severe winter weather has practically halted preparation of scrap in many dealers' yards and has held up the movement of a substantial number of carloads of scrap on sidings, with the railroads having all they can do to handle perishable goods.

Another factor pointing toward the possibility of an acute scrap shortage this winter is the inability to use a greater proportion of pig iron in the open hearth mix because of the growing shortage of iron due to lack of manpower and bituminous coal supplies.

Should weather conditions permit scrap will again begin moving through dealers' yards although on a somewhat reduced basis compared with most of last year. During the closing months of 1944 when steel mills were practically out of the market, many scrap dealers were forced to let go of some of their yard men and a further reduction in the number of peddlers occurred. It is expected that dealers may soon be granted a higher priority rating on WMC's referral list.

With scrap consumers paying a springboard of $1.50 and more in a few instances, considerable more cross hauling of scrap is expected to develop. If the current scrap shortage continues, the volume of material moving under allocation may reach that recorded in the summer of 1942 when some open hearths were forced down because of lack of scrap. Considerable tonnage of scrap is scheduled to soon move from the southern states on an allocation basis. Just recently 60,000 tons of shipyard scrap from the Pacific Coast were shipped into the Chicago area, involving an $8 a ton freight charge and an additional $3.50 a ton for preparation on some of the material.

Production scrap has held up very well in recent weeks, but this material consists mainly of turnings. Railroad scrap lists have fallen off recently, with those for January running 20 to 40 per cent below the railroads' December offerings. No improvement in the tight situation in cast scrap supplies is indicated in the near future.

With the dearth of good open hearth scrap grades expected to continue over the remainder of the winter months a substantial increase in the use of turnings in open hearth operations is a likely development.

Fifth Consecutive Annual Record for Steel Ingot Production Established During 1944

In 1944, for the fifth consecutive year, steel production exceeded all previous records, according to the American Iron and Steel Institute, New York. During 60 years before outbreak of the war the steel industry never had established new output records for more than three consecutive years.

Total production of steel ingots and castings in 1944 was 89,552,961 net tons, an increase of more than 700,000 tons over the 1943 total of 88,836,366 tons. In 1940, first of the successive record-breaking years, production was 66,981,662 tons.

December production was 7,338,299 tons, an increase over November and also over December, 1943.

STEEL INGOT PRODUCTION STATISTICS

	Estimated Production—All Companies								Calculated weekly production, all companies Net tons	Number of weeks in mo.
	—Open Hearth—		—Bessemer—		—Electric—		—Total—			
	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.		
Based on reports by companies which in 1943 made 98.3% of the open hearth, 100% of the bessemer and 87.9% of the electric ingot and steel for castings production										
1944										
Jan.	6,769,438	97.2	439,551	85.4	377,751	83.3	7,586,740	95.6	1,712,582	4.43
Feb.	6,409,981	98.4	409,781	85.2	368,555	87.0	7,188,317	96.9	1,736,308	4.14
March	6,976,450	100.1	455,368	88.5	388,408	85.7	7,820,226	98.5	1,765,288	4.43
1st qtr.	20,155,869	98.6	1,304,700	86.4	1,134,714	85.3	22,595,283	97.0	1,738,099	13.00
April	6,788,433	100.6	437,472	87.8	362,118	82.5	7,588,023	98.7	1,768,770	4.29
May	6,878,251	98.7	437,444	85.0	380,960	84.0	7,696,655	97.0	1,737,394	4.43
June	6,462,108	95.8	419,699	84.2	347,028	79.0	7,228,835	94.1	1,685,043	4.29
2nd qtr.	20,128,792	98.4	1,294,615	85.6	1,090,106	81.9	22,513,513	96.6	1,730,478	13.01
1st hlf.	40,284,661	98.5	2,599,315	86.0	2,224,820	83.6	45,108,796	96.8	1,734,287	26.01
July	6,742,830	96.5	415,543	80.9	334,710	73.7	7,493,083	94.2	1,695,268	4.42
Aug.	6,714,857	95.9	429,672	83.5	348,901	76.6	7,493,430	94.0	1,691,519	4.43
Sept.	6,500,997	96.1	398,058	80.0	330,837	75.2	7,229,892	93.9	1,689,227	4.28
3rd qtr.	19,958,684	96.2	1,243,273	81.5	1,014,448	75.2	22,216,405	94.1	1,692,034	13.13
9 mos.	60,243,345	97.7	3,842,588	84.5	3,239,268	80.8	67,325,201	95.9	1,720,112	39.14
Oct.	6,859,922	98.0	420,105	81.6	335,526	73.7	7,615,553	95.6	1,719,086	4.43
Nov.	6,571,497	96.9	403,908	81.0	298,503	67.7	7,273,908	94.3	1,691,966	4.29
Dec.	6,680,007	95.7	373,549	72.7	284,743	62.7	7,338,299	92.3	1,660,249	4.42
4th qtr.	20,111,426	96.9	1,197,562	78.4	918,772	68.0	22,227,760	94.0	1,691,610	13.14
2nd hlf.	40,070,110	96.5	2,440,835	80.0	1,933,220	71.6	44,444,165	94.0	1,691,822	26.27
Total	80,354,771	97.5	5,040,150	83.0	4,158,040	77.6	89,552,961	95.4	1,712,949	52.28

The percentages of capacity operated are calculated on weekly capacities of 1,572,755 net tons open hearth, 116,182 net tons bessemer and 102,350 net tons electric ingots and steel for castings, total 1,791,287 net tons; based on annual capacities as of Jan. 1, 1944 as follows: Open hearth 82,223,610 net tons, bessemer 6,074,000 net tons, electric 5,350,880 net tons. Beginning July 1, 1944, the percentages of capacity operated are calculated on weekly capacities of 1,580,042 net tons open hearth, 116,182 net tons bessemer and 102,757 net tons electric ingots and steel for castings, total 1,798,981 net tons; based on annual capacities as follows: Open hearth 82,604,600 net tons, bessemer 6,074,000 net tons, electric 5,372,150 net tons.

Interim Increases Are Granted on Ceilings of 5 Basic Steel Products

Price raises at mill level are first on industry-wide basis since 1939. Upon completion of study OPA will make final adjustment of interim prices and allow increases for other iron and steel products now being made at "out-of-pocket" loss

STEEL mills are operating today under their first industry-wide increase in prices in basic steel products since 1939, and are awaiting completion of a cost survey that is to provide for increases for other iron and steel products now being produced at an "out-of-pocket" loss.

The increases of from $2 to $5 per ton in ceiling prices for five basic steel products at the mill level were allowed on an interim basis by the Office of Price Administration, effective on shipments as of Jan. 11, 1945.

The increases follow: (1) Hot-rolled carbon plates produced to sheared mill or universal mill width and length tolerances, 10 cents per hundred pounds; (2) hot-rolled carbon steel sheets, 10 cents per hundred pounds; (3) galvanized sheets, roofing and siding, 15 cents per hundred pounds; (4) rails, all types and grades, $3 per gross ton; (5) nails and staples other than galvanized, 25 cents per hundred pounds.

The increases, in the form of additions to be made to present maximum delivered prices, are equivalent to $2 per net ton for hot-rolled carbon steel plates and sheets, $3 per net ton for galvanized sheets, and $5 per net ton for bright nails and staples.

Except on nails and staples, the increases will not be reflected in higher ceiling prices for sales out of warehouses.

The increases, the OPA pointed out, are based upon cost survey completed in the spring of 1944, before the Dec. 30, 1944, wage adjustment. "In view of the likelihood of intervening cost changes, these increases have been granted on an interim basis only," the OPA said. "When a cost survey of recent manufacturing experience now under way is completed, these interim price increases will be adjusted upward or downward, dependent upon the results. At that time also OPA will make whatever adjustmens are found necessary for other products."

Explains Product Selection

The five products selected for interim increases, the OPA said, were chosen for several reasons: (1) Their production is dispersed over a large segment of the industry; (2) they are major items in steel production; (3) some of the products are the subject of individual price adjustment. Companies now receiving such adjustments because of overall or product hardship will be aided by immediate price increases to the extent that these increases will either reduce the spread between their individual prices and the general price level or cause such spread to disappear.

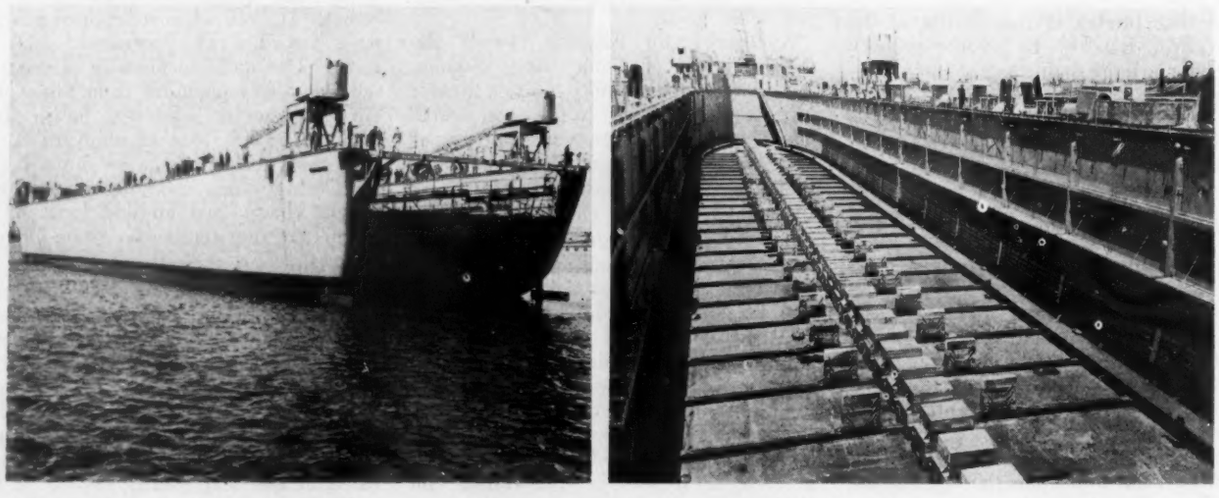
Complications that will arise from the interim increases are being pondered by the industry. One question is: How will warehouses fare without being allowed higher ceiling prices, except on nails and staples? Another is: What about the handicap on mills that buy hot-rolled sheets at increased ceilings and cold roll them but cannot pass on the increases inasmuch as the interim increases do not apply to cold-rolled sheets?

About a year ago, in response to a request from the OPA General Steel Products Industry Advisory Committee, a survey of 27 basic iron and steel products was conducted by the price agency. The industry submitted financial and cost data, on the basis of which it was determined that, although no general increase was required under the "industry earnings" standard, a number of steel products qualified for price increases under the "product" standard. In other words, while the earnings of the industry as a whole still were in excess of those of 1936-1939—the base period upon which need for price increases on an industrial standard basis are determined—some products were being produced at an "out-of-pocket" loss.

Increases in ceiling prices were then contemplated for those products sold below the "out-of-pocket" cost of the producers, but the action was deferred in view of the pending steel wage decision.

309 Ships Built in 1944 By Bethlehem Steel Co.

Bethlehem Steel Co. brought its wartime shipbuilding output to 909 vessels in 1944 by completing 309 fighting and cargo ships during that year, Eugene G. Grace, president, announced last week. The company had originally set its goal at 1000 fighting ships for the war program but this figure has been invalidated already "as the government has increased its demands on us far beyond that figure," Mr. Grace said.



FLOATING DRY DOCK: Designed to service the Pacific fleet, these auxiliary dry docks permit the repair of ships near the place they were damaged. They are built in Alameda, Calif., and have been in service since April, 1942. The dry dock can scoop up a destroyer through the gate shown at left, pump itself dry, cradle the fighting ship and permit the making of necessary repairs. At right is shown interior basin of the vessel

Policy on Meetings To Be "Tough"

Many industrial groups ponder effect Byrnes' request for elimination of conferences will have on their meetings. "Convention-in-print" method will be utilized in many instances

POLICY of the committee which will consider applications for exemption from War Mobilization and Reconversion Director James F. Byrnes' wartime ban on conventions that becomes effective Feb. 1 is expected to be "tough," it is reported from Washington.

The committee, which will pass on requests for approval of group meetings, conventions, and trade shows requiring attendance of more than 50 persons, consists of Col. J. Monroe Johnson, director of Office of Defense Transportation; Robert P. Patterson, Under Secretary of War; Ralph A. Bard, Under Secretary of the Navy; J. A. Krug, War Production Board chairman; and Charles M. Hay, deputy chairman of the War Manpower Commission. Richard H. Clare, who was about to rejoin Pennsylvania Railroad after quitting as head of the ODT passenger division, will serve as the committee's secretary, with headquarters in the Interstate Commerce Commission building, Washington. A huge number of letters and telegrams awaits action of the committee.

Forms on which to ask for approval of meetings are being distributed to ODT regional and district offices.

Ponder Effect of Request

Many industrial groups are pondering the effect that Mr. Byrnes' request will have on conventions they have scheduled or would schedule for this year. Some groups feel that their conferences are so closely linked to war production that it would be in the best interests of the nation for them to continue on the assumption that the meetings will be held. If the Washington committee does not approve a specific conference it is expected that the group which had sought the approval will abide by the committee's decision and cancel the meeting.

Among the first to announce action relative to meetings already scheduled is the American Society of Tool Engineers, the nation's largest technical production organization with a membership of more than 17,000 production executives and engineers, which has postponed indefinitely its Industrial Production Planning Exposition and its national technical sessions that had been carded for March in Cleveland.

Some groups will cancel or not schedule conventions but their directors will assemble to transact business. In some instances these proceedings will be transmitted by mail to people interested in them. A further development of this use of the mails will be the "convention-in-print" method of distributing in pamphlet form annual statements and addresses prepared by officers and people who would have been speakers had a convention been held.

"Some meetings," Mr. Byrnes said, "are desirable in the best interests of the war." However, it was his belief that these could be much fewer and the attendance smaller than at present. While Mr. Byrnes' ban on conventions has been hailed in some quarters as a relief to the nation's heavily-burdened transportation system, the question has been raised as to the extent of the relief. The statement has been made that only 1.5 per cent of the passengers on public transportation systems are going to or from conventions.

Mr. Byrnes said he was so certain that the public would co-operate that he has taken no measures to consider government enforcement procedures.

Committee approval of meetings of more than 50 people does not guarantee transportation, hotel facilities or imply priorities for their use. General exemption from necessity of permit for meetings of less than 50 people does not mean the committee approves them.

An ODT spokesman expressed disappointment because of the relatively few conventions canceled in 1944, in contrast to the large number of meetings held during the year and those planned for 1945. He reported that only 183 conventions were canceled last year, while more than 5000 were held, not counting many meetings of industry.

Mr. Byrnes emphasizes the seriousness of the railroad situation by comparing the smaller number of railroad cars now available with those on hand during World War I, although three times as many military personnel are being moved in the present war. "I am advised that our railroads have 38,872 coaches and other passenger units now, as compared with 53,941 in 1918. Our organized military movements alone in 18 months of this war have required the transportation of 16 million persons, compared with 6½ million in a corresponding period during World War I.

"We have about the same number of coaches and only a limited number more Pullmans now than we had in 1939. The military forces are using 10 to 15 per cent of the coaches and almost half of the Pullmans. In the face of this, revenue passenger-miles have increased from 22,600,000 in 1939, 29 million in 1941 and 53,600,000 in 1942 to an estimated 96 million in 1944," Mr. Byrnes said.

POSTWAR PREVIEWS

ALCOHOL-WATER INJECTION— Better performance in both automobile and aircraft engines may result from alcohol-water injections, SAE members told. See page 46.

SCRAP— Policies governing disposal of termination scrap outlined at convention of American Institute of Scrap Iron & Steel. Buyers to be protected from loss on purchases for war account. See page 48.

TRADE PRACTICES— Federal rules on trade practices gain favor among business men as many industries grow to like certain wartime restrictions and want them continued permanently. See page 52.

AUTOS— Engineers hear what public wants in postwar passenger cars. See page 61.

SURVIVAL— Study indicates average airframe manufacturer can survive immediate postwar adjustment period if proper preparations are made by companies and the government. See page 68.

SHAPING ALUMINUM— Unconventional practice by Ford in adapting steel dies to fabrication of aluminum alloy materials permits handling of larger sections, reduces press setups and assembly labor. High precision in production runs indicates methods may be advantageous for other industries. See page 78.

WELDED PLATES— Understanding of factors causing failure in welded ship plates may lead to improvement in all longitudinally welded structures. See page 80.

FURNACES ON DRY BLAST— Use of dehumidified air leads to production of better pig iron at lower cost. Fuel economy, smooth operation and uniformity of product invite further investigation of dry blast applications. See page 96.

Trade Practice Rules Gain Favor; More Industries Seek Benefits

Businessmen find procedure has advantage of eliminating undesirable, inefficient, and, in some cases, deceptive and dishonest practices. One hundred and fifty industries now operating under rules, while 26 more have applications pending

GREATER interest in the Federal Trade Commission's trade practice conference procedure has developed among business men in recent months. At the turn of the year the commission was dealing with 26 industries desiring trade practice rules, and new applications are being received at the rate of one or two weekly.

Main reason for this trend is that many industries have grown to like certain wartime restrictions under which they have operated and want to have them continued permanently. They do not want to invite a return of the cut-throat methods of the past.

As an example, the Federal Trade Commission is working with an industry which sells its products through hundreds of thousands of retail stores all over the country. Under the stress of fierce competition, it became customary for this industry to supply signs and fixtures and all sorts of special service to the retail outlets.

During the war, due to the need to conserve materials and manpower, all of these extras have been eliminated. Special service has gone out of the window. The industry has had a chance to sit back and find out just how much all those extras cost. It has had a chance to appreciate the advantages that result when undesirable, inefficient and, in many cases, deceptive and dishonest business practices are eliminated.

Seek Favorable Postwar Rules

Many of the industries that benefited from war restrictions, therefore, are approaching the Federal Trade Commission for rules under which they may function to advantage after the war is over.

Another reason why at least some industries have requested the co-operation of the Federal Trade Commission in formulating trade practice rules arises from present uncertainty as to the future legal status of companies that comply with orders of the director of reconversion in the immediate postwar period. Whereas the attorney general has agreed not to prosecute for antitrust law violations incident to compliance with orders of the War Production Board and other war agencies, the question of postwar immunity still remains to be answered.

Under these circumstances it has occurred to many business leaders that it might be doubly beneficial to get their "houses in order" for the postwar period. Not only would they thus prevent a return of undesirable practices in their industries, but, through the adoption of trade practice rules, they automatically would come under the wing of the Federal Trade Commission. It might prove valuable to have the moral support of this organization, they believe, should the Department of Justice on some future occasion decide on a campaign of anti-trust actions springing out of compliance with orders of other government agencies.

The present boom in new trade practice business, as far as the Federal Trade Commission is concerned, is a gratifying development. Based on its experience, the commission feels that as more industries come under trade practice rules the beneficial results of this program are more widely felt. What surprises the commission is that, after more than 15 years' successful operation of the trade practice program, so many businessmen do not appear to be informed about it.

Some Industries Lack Rules

"Whereas some 150 industries now are operating under trade practice rules, and 26 additional industries now have applications pending for such rules," says Henry Miller, the commission's director of trade practice conferences, "there are at least 200 industries that do not yet have such rules but which would benefit by having them."

One feature of the program is that businessmen, once they have had experience with it, like it. This is attested by a large file in Mr. Miller's office devoted to comments from many with whom the commission has worked on trade practice rules. These uniformly are of a complimentary and appreciative character; a typical expression, from the scrap iron and steel industry, reads as follows:

"Whatever we have accomplished in setting high merchandising standards for our industry . . . is chiefly to be credited to the trade practice conference of the industry and the encouragement and backing of the Federal Trade Commission . . . The trade is impressed with the improvement in conditions . . ."

The program also has won wide endorsement from trade and business associations. These expressions are typified by the following resolution adopted a number of years ago by the Chamber of Commerce of the United States:

"The principle of the trade practice conference procedure of the Federal Trade Commission is endorsed as a useful and proper means of promoting better standards of business and the elimination of unfair competitive practices. There should be a full examination of the possibilities of the trade practice conference procedure by each industry desirous of raising the level of its competitive standards, in order that it may properly evaluate the benefits which this method offers under the conditions confronting the industry involved."

HENRY MILLER
Director, Trade Practice Conferences, Federal Trade Commission

For the many business men who have not yet benefited from the trade practice program, its objective is described as follows by Mr. Miller:

"The establishment of fair trade practice rules offers a simple and inexpensive way of solving many problems of industry. Unfair methods stifle trade and commerce. They make it difficult, if not impossible, for industry members generally to render honest, efficient service to the public, and to be rewarded with a fair profit gained on a sound, competitive basis. The prevention of such unfair practices, with their consequent waste, and their repressive and disruptive influences, not only fulfills the policy of the law but also promotes the welfare of industry and the best interests of the purchasing and consuming public."

The first move in setting up trade practice rules for an industry takes the form of an application from that industry, or a substantial part of it, for a conference. The application sets forth the bad practices that should be eliminated, and suggests the rules that are needed. After satisfying themselves that state-

ments set forth in the application are warranted on a factual basis, Mr. Miller schedules a conference to which all members of the industry are invited, but which they are not compelled to attend. Mr. Miller and his staff, incidentally, are available at all times to answer questions any member of an industry may ask.

At this conference, a proposed code of trade practice rules is drawn up and left with the commission which studies it to make sure that all the rules are in proper relationship with the law, that they will work toward constructive ends, and that their operation will not cause undue hardships or inequities.

Next, the code of rules, as approved by the commission, is made available to all interested parties, along with a request that they express their views and suggestions. Finally, after all questions and suggestions have been considered in conference by the industry and the commission, the rules are promulgated by the commission and administered as the trade practice rules for the industry. Each member of the industry is supplied with a copy and given an opportunity to signify his intention or willingness to observe them in the conduct of his business.

"It is thus made possible," says Mr. Miller, "for all to abandon bad trade practices, voluntarily and co-operatively, and for all in an industry to start anew, as of a given date, on a fair, equitable basis, without undue advantage of one competitor over another. Under this procedure, the members of an industry write their own rules, and the function of the commission in approving them is largely in the form of a check to make sure they do not run counter to any laws."

The commission's functions under the trade practice program, Mr. Miller emphasizes, are not punitive; rather, they are preventive and remedial.

"Occasionally I am asked by businessmen whether they run the risk of waiving any of their legal rights by co-operating in the establishment of trade practice rules," says Mr. Miller. "No—not at all. Their rights are fixed by law and no one is asked or expected to waive or deprive himself of any of his rights."

At the same time, it must always be remembered that trade practice rules may incorporate only such provisions as are permissible under business law. Whereas a pledge to obey its industry trade practice rules does not mean any loss of a company's legal status, so failure to make such a pledge in no way conveys immunity upon a non-co-operative company.

Because of this situation, it is customary to split up trade practice rules into two classifications. One of them, referred to as Group I, includes the rules that ban practices which also come within the scope of the commission's statutory responsibilities. The number of such practices is rather large, covering fraud, deception, bad faith, oppression, confusion or other types of "unfairness." The only reason for outlawing such unfair acts under individual industry codes is because of the desirability of defining the acts in the terms peculiar to each industry; this makes for a clear understanding and discourages violations through ignorance of the law.

Thus, compliance with Group I rules is mandatory in an industry irrespective as to whether a company may have failed to take part in formulating the rules, or whether it has pledged itself to comply.

Compulsory Requirements in Group I

"Group I rules thus may be said to express the compulsory requirements," explains Mr. Miller. "The trade practice rules also may include permissive practices which usually do not involve questions of law. These permissive practice rules are referred to as Group II. The rules in Group II usually are such that an industry is only too glad to follow them once they are set up with commission acceptance. Very little occasion for considering the enforcement of Group II rules has developed."

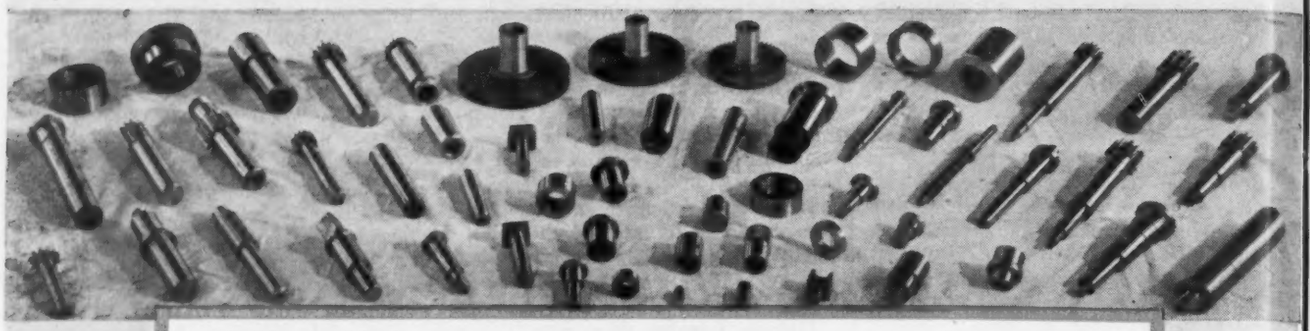
The commission never prosecutes for violation of trade practice rules, Mr. Miller emphasizes. When confronted with the necessity for enforcement, it exercises its statutory powers to eliminate the unfair competitive method involved in the particular case. Under the trade practice rules program, he points out, enforcement usually is accomplished through co-operation, on a basis of voluntary action. One of the good features of the program, he says, is that it also reduces expenses of litigation.

"It avoids the necessity of calling into play compulsory legal processes against offenders, a procedure which is costly alike to business and the government," says Mr. Miller. "We all know how expensive litigation is and how disruptive it may be to business good will. Friendly, voluntary correction is the proper way to serve the public interest —as well as one's own interest."

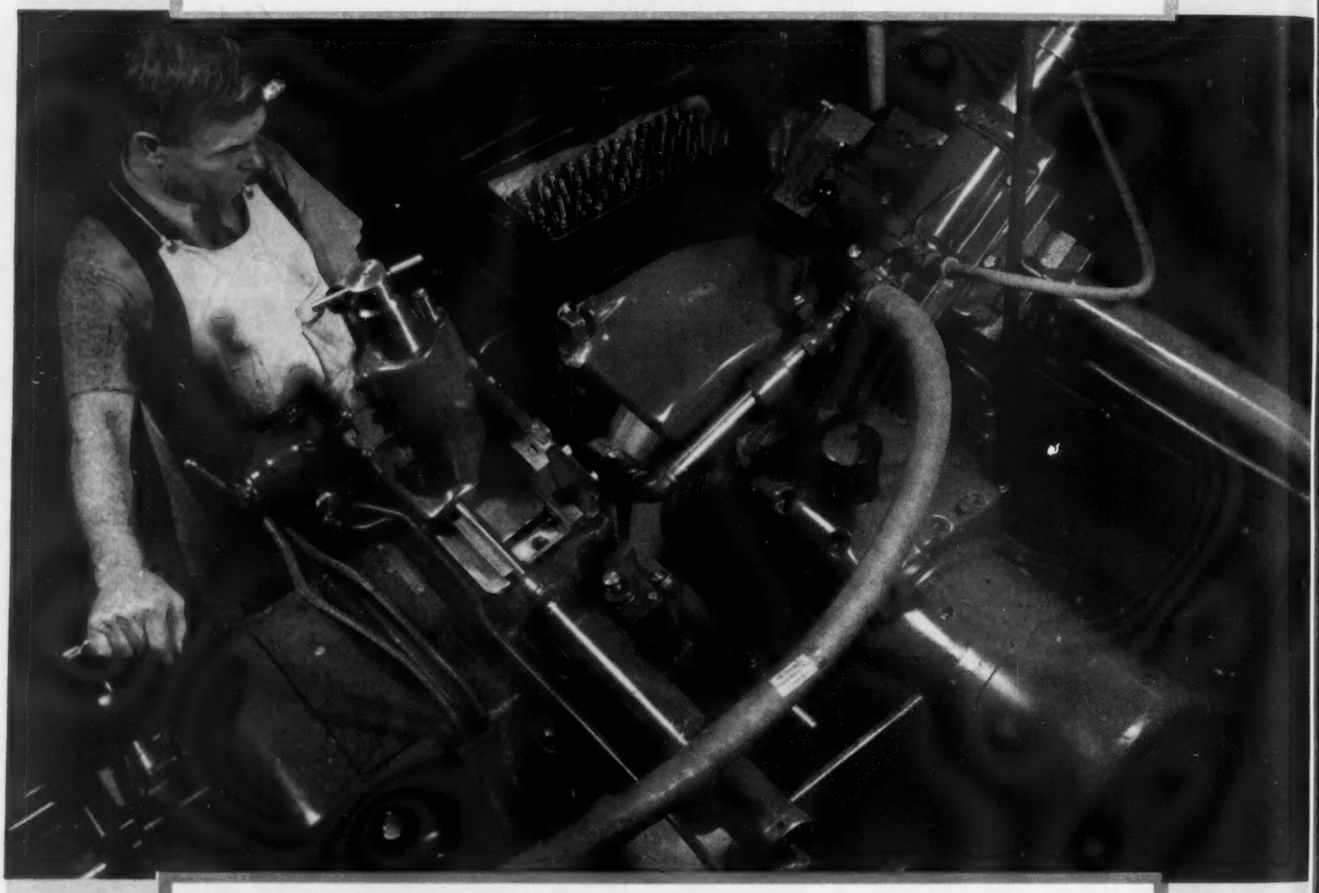
The commission proceeds on the principle that an unnecessary multiplicity of regulations is to be avoided; "that American business has the right to grow and develop with as much freedom as possible, subject only to a minimum of restriction necessary to insure protection of the public."

In certain instances, however, it is necessary to go into more detail than in others, as when it is necessary to establish standards, definitions or minimum specifications. It frequently is necessary to do this in industries which manufacture products containing various ingredients whose proportions may be varied, or which may be replaced by substitutes. By incorporating such standards in the rules of certain industries, says Mr. Miller, it was possible "to bring order out of chaos, to prevent unfair exploitation of the public, the destruction of consumer demand, or the undue advantage of one competitor over another. In certain situations the lack of such recognized standards opens wide the door to fraud, deception and cheating of the buying public, or to practices which are frequently disastrous to the ethical manufacturer who believes in giving the public full value for its money."

GOP LEADERS: Pictured here following a Republican conference which re-elected them to their party posts in Congress are, left to right: Sen. Kenneth S. Wherry, Nebraska, party whip; Sen. Wallace White, Maine, floor leader; Sen. Arthur Vandenberg, Michigan, chairman of the conference; and Sen. Robert Taft, chairman, steering committee. NEA photo



These widely differing parts were all ground on a CINCINNATI *No. 2 Centerless Grinder. Average quantities range from 25 to 500 pieces.*



Close-up of a CINCINNATI *No. 2 Centerless Grinder set up for a typical infeed job. The Hydraulic Profile Truing equipment over the regulating wheel is especially desirable on machines used for small lot production.*

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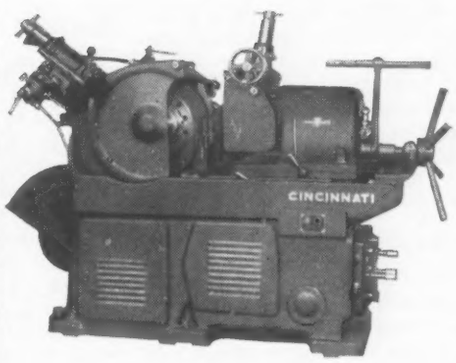

CINCINNATI No.2 Centerless Grinder. Catalog G-456-2 contains complete specifications. Copy sent on request. For a brief description of this machine, look in Sweet's Catalog File for Mechanical Industries.

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Private Groups Handle Industry's Surplus Material

Government agency is leaving disposal of industry's surpluses to privately-sponsored services

LAST September, the War Production Board suddenly abandoned its Redistribution Division which served as a clearing house for surplus materials and equipment and the division's 13 district offices gave up distributing lists to industry. These lists noted the kind of material or equipment, specifications and reference code numbers and one of the last issued by a single office contained nearly 600 items ranging from 200 tons of hot-rolled bars in 15 different sizes to a 36-inch band saw and 6896 zippers 22½ inches long.

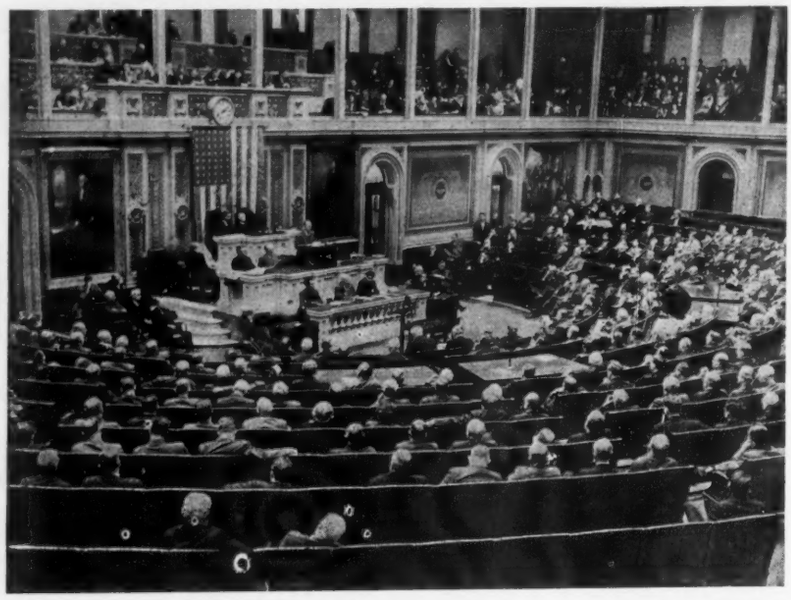
The Redistribution Division was formed to take over the work handled by such short-lived organizations as the Steel Recovery Corp. and the Copper Recovery Corp. It, too, fell by the wayside when the Surplus War Properties Administration came into being to dispose of the anticipated huge surpluses of all types of government-owned property through the Procurement Division of the Treasury Department, the Surplus War Properties Division of the Reconstruction Finance Corp. and the War Food Administration.

Avoids Purchase by Spectators

So far, the three disposal arms of the SWPA, now under direction of a 3-man board, have displayed an inclination to feed the already growing surpluses into private consuming channels and thus prevent a situation which arose in the last war when large quantities fell into the laps of speculators.

SWPA, however, is not taking over one phase of the job performed by WPB's Redistribution Division—the disposal of surplus materials and equipment owned by industry. As a result, two or three privately-sponsored services have sprung up to take over this work. One of these, the Commodity Service Co., has been set up in Cleveland by Howard F. Randall, formerly assistant regional priorities director in the Cleveland office of WPB. The new company will serve as a clearing house or medium of contact for holders and prospective buyers.

Commodity Service Co. charges 10 cents per item for listings in a bulletin sent to some 10,000 plants, plus a service fee of 5 per cent on sales. During his business career, Mr. Randall has been executive vice president of the Superior Foundry Co., Cleveland; general manager, Eureka Copper Products Co., Cleveland, and general manager of the G. H. Williams Co., Erie, Pa.



HEAR PRESIDENT'S MESSAGE: Members of Congress are shown in joint session as House Reading Clerk George Maurer reads the President's annual state of the union message. NEA photo

Offers New Listing of Surplus Machine Tools

A new method recently adopted by the Defense Plant Corp. has made easier the task of acquainting potential buyers with the types and sizes of surplus machine tools and allied equipment available for sale by this corporation. It is a list under such general heads as "external grinders," "planers," "broaching machines," etc., of the tools held by the agency. Copies of this list are mailed to thousands of potential buyers throughout the United States; these buyers then ask their regional DPC offices for complete information about the items in which they are interested.

The first list, consisting of two 8 x 10¼ inch pages, was sent out in December and was instrumental in the sale of some 500 tools since that date. It is planned to issue this monthly; the second issue was scheduled around Jan. 10. Interested parties can get copies of these lists regularly from the DPC regional offices. Tools now held for sale by the DPC number around 2300; the number changes constantly by reason of sales and surplus declarations by agencies.

Civilian Transportation Construction Rises Sharply

Production of civilian transportation equipment was larger in 1944 than in 1943, the Office of Defense Transportation reported recently, but it remains on a level far below that of prewar years for many items. Locomotive production is close to schedule with 963 units, compared with 830 in 1943. ODT's program called for production in 1944 of 50,000 freight cars, but this was reduced to an actual production of 42,810 largely because of manpower shortages. This compared with production of 28,790 freight cars in 1943, materials shortages having reduced output in that year.

An important item of railroad equipment is new replacement rail, of which 1,900,000 tons were furnished in 1944 compared with 1,540,000 tons in 1943.

Production of trucks increased to 96,084 (101,000 scheduled) from only 2699 in 1943. This production for civilian use is small, however, when compared with average production in immediate prewar years of 600,000 trucks. Production of automotive replacement parts rose to a new all-time high of $800 million compared with the prewar high of slightly over $600 million.

OPA To Survey Costs In Crude Oil Industry

Survey of costs in the crude oil producing industry to determine if existing ceiling prices of crude are adequate will be undertaken by the Office of Price Administration, Chester Bowles, administrator, has announced.

"This does not represent any change in OPA's position, stated many times, that, in its opinion, there should be no general price increase for the crude oil industry as a whole," Mr. Bowles explained. "We are glad to make the survey in response to congressional committee and industry requests for a cost study. This will give us additional data for determining whether OPA's stand against a price increase is justified."

Specific Maximum Prices Set For Small Orders of Castings

Foundries have option of pricing their products either on new dollar-and-cent ceilings or on previous basis of October, 1941, price factors. New prices reflect general average of current prices charged on small orders

SPECIFIC ceiling prices at the foundry level have been established by the Office of Price Administration for small orders of malleable iron castings, effective Jan. 13.

The new ceiling prices reflect generally the average of current prices charged by foundries on small orders, except that in some cases they are lower than those the seller would be entitled to if calculated on the previous basis of October, 1941, price factors. However, the new dollar-and-cent ceilings are optional, the castings producer being permitted to use the old "formula" prices if he desires.

Procedure Switching Prohibited

Once the foundry elects to use a new dollar-and-cent ceiling price for an item, OPA pointed out, he must continue to use that ceiling for the item. He may not switch back to formula pricing.

OPA added that short orders are not an important part of the operations of most foundries from the income standpoint, although many fill a large number of short orders daily. Many castings manufacturers in the past have taken short order business at a loss simply for the purpose of accommodating customers.

A "short order" is defined for pricing purposes as an order for the purchase of malleable iron castings where the shipping weight of the casting multipled by the quantity ordered does not exceed 200 pounds. If the casting is produced or is to be produced on a production run where the 200-pound limitation is exceeded or is to be exceeded, the order shall not be considered a "short order."

The new ceiling prices for short orders, as shown in the accompanying tables, are arranged on both a "per pound" and "per casting" basis. The producer, thus, may price his product either by the pound or by the piece.

Maximum prices for small orders previously have been: (1) Maximum price charged for the casting sold as a short order between Oct. 1 and Oct. 15, 1941; or (2) if there was no quoted price in a published price list for the casting and it was not sold during the Oct. 1-15, 1941, period, the ceiling price has been one determined by cost calculations using returns and costs in effect Oct. 15, 1941; or (3) a ceiling price could be determined by adjusting prices charged between Oct. 1 and Oct. 15, 1941, in accordance with the customary industry practice of the seller to reflect small quantity orders.

Malleable iron castings go into a wide variety of both wartime and peacetime goods. Typical malleable iron castings are the rear axle housings on motor trucks, journal box covers on railroad cars, and pipe couplings in the tubular pipe field. They are heavily produced for use in the manufacture of tanks, ships, jeeps and other military vehicles.

CEILING PRICES FOR SMALL ORDERS OF MALLEABLE IRON CASTINGS

(PRICES PER POUND, F.O.B. FOUNDRY)

Weight per Casting in Pounds	Number of Castings 1-3	4-9	10-24	25-49	50-99	100-249	250-499	500-1000
¼ and under	$7.7025	$2.8675	$1.3550	$0.8500	$0.6300	$0.4650	$0.3700	$0.3050
Over ¼ to 1	2.4900	1.1150	.6650	.5075	.4125	.3275	.2575	.....
Over 1 to 2	1.2625	.6575	.4650	.3800	.3275	.2525	.....	.....
Over 2 to 4	.7925	.4500	.3400	.2725	.2425	.....	.....	.....
Over 4 to 8	.5025	.3400	.2625	.2050	.....	.....	.....	.....
Over 8 to 15	.3550	.2600	.2125	.....	.....	.....	.....	.....
Over 15 to 25	.2725	.2100	.1775	.....	.....	.....	.....	.....
Over 25 to 50	.2050	.1700	.....	.....	.....	.....	.....	.....
Over 50 to 80	.1650	.1425	.....	.....	.....	.....	.....	.....
Over 80 to 100	.1550	.....	.....	.....	.....	.....	.....	.....
Over 100 to 200	.1450	.....	.....	.....	.....	.....	.....	.....

(PRICES PER CASTING, F.O.B. FOUNDRY)

Weight per Casting in Pounds	Number of Castings 1-3	4-9	10-24	25-49	50-99	100-249	250-499	500-1000
¼ and under	$1.3479	$0.5018	$0.2371	$0.1488	$0.1103	$0.0814	$0.0648	$0.0534
Over ¼ to 1	1.5563	.6969	.4156	.3172	.2578	.2047	.1609	.....
Over 1 to 2	1.8938	.9563	.6975	.5700	.4913	.3788	.....	.....
Over 2 to 4	2.3775	1.3500	1.0200	.8175	.7275	.....	.....	.....
Over 4 to 8	3.0150	2.0400	1.5750	1.2300	.....	.....	.....	.....
Over 8 to 15	4.0825	2.9900	2.4438	.....	.....	.....	.....	.....
Over 15 to 25	5.4500	4.2000	3.5500	.....	.....	.....	.....	.....
Over 25 to 50	7.5953	6.3750	.....	.....	.....	.....	.....	.....
Over 50 to 80	10.7250	9.2625	.....	.....	.....	.....	.....	.....
Over 80 to 100	13.9500	.....	.....	.....	.....	.....	.....	.....
Over 100 to 200	21.7500	.....	.....	.....	.....	.....	.....	.....

War Contracts in Fifth Region Exceed $21 Billion

Prime contract and facility awards placed since the beginning of the war in War Production Board's fifth region, including parts of Ohio, Pennsylvania, West Virginia and Kentucky, have amounted to $21,571,106,000. Of the total, aircraft contracts amounted to $5,205,101,000; ships, $2,235,914,000; ordnance, $5,449,201,000; and other contracts, $5,984,012,000. Industrial facility awards equaled $2,342,830,000, and military facilities, $354,648,000. Contracts of less than $50,000 are not included in the figures.

First Quarter Bathtub Quota Set at 50,000

Production of 50,000 cast iron bathtubs during the first quarter of 1945 has been authorized by the War Production Board for limited distribution. This rate is the same as that maintained during 1944. The following five manufacturers have been authorized to produce 10,000 tubs in the first quarter: American Radiator & Standard Sanitary Corp., Louisville, Ky.; Crane Co., Chattanooga, Tenn.; Eljer Co., Salem, O.; Kohler Co., Kohler, Wis.; and Richmond Radiator Co., Uniontown, Pa. Any deficit in fourth quarter 1944 quota production can be made up only during the month of January, 1945.

WPB Assigns Quotas for Refrigerator Production

Quotas for production of 54,995 domestic ice refrigerators in the first quarter of 1945 to meet military and essential civilian requirements have been assigned by the War Production Board. Additional authorizations for the production of 20,005 units, bringing total first-quarter authorized production to the permitted maximum of 75,000, will be assigned later. Manufacturers and their present quotas are: Arctic Refrigerator Co., 3537, Atkins Table & Cabinet Co., 1174, Brunswick Refrigerator Co., 2295, Dratch's Victory Refrigerator Box, 1624, Fy-Boro Metal Products Co., 4347, Iceland Refrigerator Co., 2103, King Refrigerator Corp., 2355, and Precision Metal Products Co., 575, all of Brooklyn, N. Y.; Doherty-Stirling Inc., Baton Rouge, La., 164; Ice Cooling Appliance Corp., Morrison, Ill., 16,171; Maine Mfg. Co., Nashua, N, H., 9900; Sanitary Refrigerator Co., Fond du Lac, Wis., 6000; Stoddard Mfg. Co., Mason City, Iowa, 750; and

Ward Refrigerator & Mfg. Co., Los Angeles, Calif., 4000.

Use of stainless steel, monel and inconel metal is prohibited in the manufacture of domestic ice refrigerators, but use of other types of iron and steel, except galvanized steel, is permitted to the extent that they are available under the Controlled Materials Plan or from idle and excess inventory. Use of galvanized steel is limited to a maximum of 15 pounds per refrigerator. No restrictions have been placed on the use of aluminum and magnesium for production of this product. WPB is allocating a maximum of 100 pounds of metal per refrigerator.

Aluminum Co. Closes Sheet Order Books Through April

Extremely tight situation in aluminum sheet has forced the War Production Board to instruct the Aluminum Co. of America to close its order books for the first four months of 1945. Critical position of aluminum sheet was reported recently by T. E. Covel, deputy director, Aluminum and Magnesium Division, War Production Board, in an address before the Chamber of Commerce, Knoxville, Tenn. He said orders already received by Alcoa exceed its anticipated production for the first three months of 1945.

Period Made Uniform for Reporting Employment

Business and industrial establishments that are required to report general purpose information to federal agencies on the number of employes, payrolls, hours worked, or related items will report hereafter for payroll periods ending nearest the fifteenth of the month. This was announced recently by Harold D. Smith, director, Bureau of the Budget.

Nelson Named Director of New WPB Aircraft Division

Henry Nelson, Chicago, Ill., has been appointed director and Morton H. Wilner, deputy director, WPB's new Aircraft Division. Mr. Nelson is an executive on leave from International Harvester Co.

The new division has been set up as a part of WPB's Radio and Transport Bureau within the Office of the Operations Vice Chairman. The Aircraft Priorities Branch and the Project Rating Branch have been transferred to the new division from Aircraft Production Board.

° ° °

Creation of the Division of Large Vessels Disposal and the appointment of Commodore E. J. Moran to head the new unit have been announced by the United States Maritime Commission and the War Shipping Administration.

° ° °

Philip S. Brayton has been appointed vice chairman, National Airframe Panel, National War Labor Board.

PRIORITIES–ALLOCATIONS–PRICES

Weekly summaries of orders and regulations, together with official interpretations and directives issued by War Production Board and Office of Price Administration

INSTRUCTIONS

BRASS: All brass mills must notify WPB at least five days in advance before scheduling any outstanding Z-1 orders. Mills are required to give WPB advance notice of intent to schedule Z-1 orders, in order to channel this capacity, if possible, into additional production of brass mill products for the small arms ammunition and artillery programs of the armed services.

CARBON STEEL SCRAP: All basic open hearth steel ingot producers now are prohibited from accepting further shipments of electric furnace and foundry steel scrap. Basic open hearth operators may apply to the WPB requesting exceptions, and must furnish complete information to justify departure from the terms of direction 1 to general preference order M-24. The grades that the basic open hearth consumers are prohibited from purchasing are the following: Billets, bloom and forge crops; bar crops and plate scrap; cast steel; punchings and plate scrap; electric furnace bundles; cut structural and plate scrap (3 feet and under); one and two-foot foundry steel; springs and crankshafts.

INDEX OF ORDER REVISIONS

Subject	Designations
Chain, Steel	L-193-a
Chemicals	P-89
Dishwashers	L-248
Machine Tools	E-1-b
Machinery, Food Processing	L-292, P-115, P-118
Price Regulations	
Fire Clay and Refractory Brick	No. 188
Plumbing Fixtures	No. 188

E ORDERS

MACHINE TOOLS: Machine tool purchase orders of the Army, Navy, Maritime Commission or their prime and subcontractors must be accompanied by original or photostatic copies of WPB-542 certificates to permit identification with urgent programs. Jurisdiction of stationary automotive crankshaft regrinders has been transferred from the Automotive Division to the Tools Division. This item is now covered by order E-1-b instead of order L-270. Listing of die casting machines and wire drawing machines has been clarified. (E-1-b)

L ORDERS

STEEL CHAIN: Purchasers of stamped steel open hook type chain are no longer required to limit their inventories to a 45-day supply. This action was taken by eliminating this type chain from the definition of "sprocket chain" in the controlling order. (L-193-a)

DISHWASHERS: A small size commercial dishwasher (minimum capacity of 500 dishes per hour) and a popular size commercial glasswasher (minimum capacity of 2000 glasses per hour) now may be produced for sale to hospitals, institutions, in-plant feeding establishments, and to fill other essential needs in order to maintain adequate sanitary conditions. Until the materials situation improves, only victory models using no stainless steel and a limited amount of copper will be permitted. Any reference to the percentage of the base year production that will be permitted has been removed from the order. Applications from new manufacturers will be accepted and the order requires applicants to consult with WPB field representatives before submitting form WPB-3820 concerning their manpower requirements. (L-248)

FOOD PROCESSING MACHINERY: Food processing machinery now may be made available to any person on an unrated order. Restriction requiring an AA-5 or better rating for purchase of such equipment has been removed, although priorities assistance, if required, will be available for the procurement of equipment necessary to the maintenance of existing operations and the expediting of War Food Administration programs. In these instances, applications for preference ratings will be filed with the nearest WPB field office on form WPB-541 or, where construction is involved, on form WPB-617. Use of special application forms WPB-576, 748 and 3155 has been discontinued. Various schedules of the order have also been amended to conform with the amended order.

Orders P-115, controlling the distribution of canning machinery, and P-118, controlling the distribution of dairy and poultry machinery, have been revoked. (L-292, P-115, P-118)

P ORDERS

CHEMICALS: Quotas for 1945 for maintenance, repair and operating supplies for the chemicals industry have been established. Cost of installations for minor capital additions is not now included in the $500 maximum permitted by the order. Allowance for MRO supplies for the January release of industrial alcohol facilities and for any similar exceptional cases that may be authorized by WPB has been included in the provisions of the amended order. (P-89)

PRICE REGULATIONS

FIRE CLAY AND REFRACTORY BRICK: An increase of 3 per cent in present ceiling prices of fire clay and silica refractory brick produced in the area east of the Mississippi river, and in the state of Missouri has been granted, effective as of Jan. 8. The increase applies directly to manufacturers' previous ceilings which were the highest prices individual producers had in effect during March, 1942, to each class of purchaser. The increase also applies to ladle brick, sleeves and nozzles, runner brick, hot tops, superclay and high-alumina brick, ground fireclay, silica cement and other low temperature mortars. Glass house brick, insulating fire brick, high temperature bonding mortars, plastic fire brick, and castables are not covered by the amendment. In quoting new prices to their customers as a result of the 3 per cent increase, manufacturers are permitted to round-off resulting prices to the nearest even five cents. (No. 188)

PLUMBING FIXTURES: A simple pricing formula applying to all sellers of unplated polished brass plumbing fixture fittings and trimmings has been announced by OPA. Use of chrome plating as a finish for the products has not been allowed. Manufacturers and resellers who had prices in effect for chrome plated brass plumbing fittings and trimmings during March, 1942, are permitted to use these prices for the unplated polished articles. The same discounts, allowances and price differentials to the various classes of purchasers in effect during March, 1942, for plated items remain in effect for the unplated articles. Manufacturers who were not producing the fittings and trimmings in March, 1942, will establish maximum prices under the building materials regulation (No. 188). Resellers who did not handle the commodities during March, 1942, will establish their ceilings under the general maximum price regulation. (No. 188)

Dominion War Production Is At High Level

New year opens with output close to peak. 1944 volume almost equaled the 1943 high mark despite cutbacks

CANADA enters 1945 with war output close to peak. Total physical volume of war production for 1944 was almost equal to the all time high of 1943. Cutbacks of some items, such as cargo ships, guns and small arms, were compensated by increased production of such items as mechanical transport, instruments, and signal equipment.

There is no immediate prospect of any substantial overall cutback for at least three months, and in some items, particularly certain types of ammunition, the output will be stepped up sharply in 1945.

Although overall production volume has been maintained, improved manufacturing methods coupled with virtual completion of all war construction, have meant a drop in expenditures. During 1944 the Munitions and Supply Department spent nearly $8,000,000 daily for shells, ships, guns, fighting vehicles, planes and other war supplies. This is approximately $1,000,000 per day less than in 1943 and $1,000,000 per day more than in 1942. Expenditures in 1941 and 1940 ran to about $3,500,000 and $1,500,000 per day, respectively. Since the beginning of the war, the Munitions and Supply Department alone has made commitments totaling more than $10,255,000,000.

Rates Second in Exports

Largely because of this enormous war production, and because about four-fifths of her foreign trade is of a wholly wartime character, Canada now ranks as the second greatest exporting nation in the world. During 1944 she exported about $3 billion worth of items of all kinds, of which about three-quarters were war materials. Approximately the same as that of 1943, this figure is two and a half times greater than in any year of the first World War, and three times greater than in 1939.

To make these achievements possible, output of raw materials was increased greatly. Among the United Nations this country is today the third largest producer of timber and the fourth largest producer of steel, and is at or near the top in output of nickel, asbestos, platinum, radium, gold, aluminum, mercury, molybdenum, copper, zinc, lead, silver, arsenic and magnesium. For the first time in her history, Canada is producing synthetic rubber, mercury, magnesium ingots, tin, tungsten, chrome concentrates, aviation gasoline and many types of complicated machine tools.

Even more startling have been the advances in the production of finished products. With some minor exceptions, before this war Canada was producing no defense equipment. Today the list of items, ranging from military locomotives to bullets, from destroyers to lifebelts, runs to many hundreds. For the first time in history, this country is making artillery units, both large and small; filled, complete rounds of heavy projectiles; Lancasters, Mosquitos, and other large aircraft; Algerines, frigates, and other fair-size warships; radar and other intricate electrical and signal apparatus; military precision instruments; armored vehicles, super-explosives, self-propelled guns, and a wide range of other equipments, components, and supplies.

From Canadian shipyards have been launched, to the end of 1944, in excess of 1000 ships, including some 380 frigates, corvettes and minesweepers, more than 280 Fairmiles, motor torpedo boats, war tugs, and other ships, and some 360 cargo ships and tankers. From the automotive plants have come 700,000 units of mechanical transport, and from these and other plants more than 45,000 armored fighting vehicles, including self-propelled guns and tanks. Apart from motorcycles and tanks, these 745,000 vehicles, costing more than $2,100,000,000 are enough to equip the whole German army.

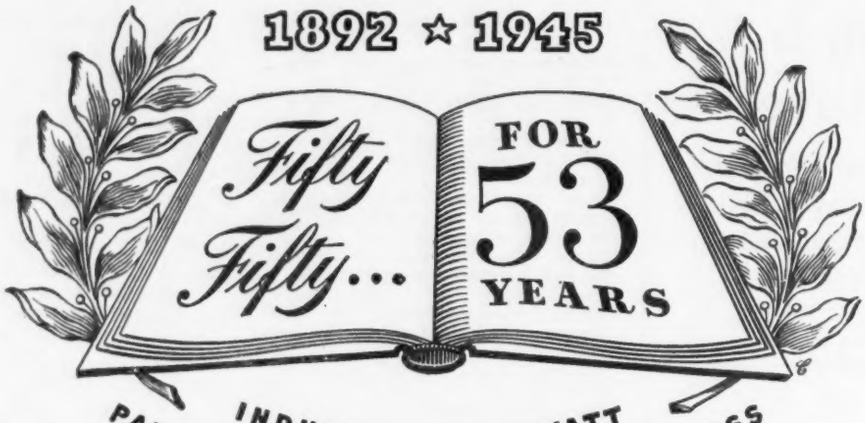
Canada also has produced nearly 15,000 planes, more than 1,400,000 machine guns and other small arms, more than 50,000 complete artillery units, approximately 1,500,000 tons of war chemicals and explosives, about $18,000,000 worth of rail equipment, locomotives, and freight cars, and in excess of $450,000,000 worth of radar, signal apparatus, electrical devices, and instruments, including devices requiring the finest of optical glass. On top of this, Canada has made in excess of 110,000,000 heavy projectiles, and of small arms ammunition, the cumulative total now reaches 4,200,000,000.

To make these war supplies has called for prodigious quantities of raw materials. Canada produces not only for herself but also for the United States, the United Kingdom, and other United Nations. In the full five years of war, steel output has been an estimated 11,982,000 long tons of ingots. The 1944 output was about 2,560,000 tons against 2,543,771 in 1943. In terms of the Allied war effort, and excluding U.S.S.R. production, Canada has contributed 85 per cent of the combined nickel output of the United Nations; 20 per cent of the zinc output; 14 per cent of the copper output; 19 per cent of the lead output; 78 per cent of the asbestos output; and 35 per cent of the aluminum output. In addition, Canada turns out substantial quantities of alloying metals, of incalculable importance to the war production.

CANADIAN MUNITIONS PRODUCTION

	To Oct. 31/44 (Actual)	To Dec. 31/44 (Estimated)
10,000 ton ships*	303	314
4,700 ton ships	26	31
3,600 ton tankers	6	6
Tugs	160	182
Frigates, Corvettes, Minesweepers	349	368
Fairmile patrol boats	88	88
Motor Boats	24	24
52 foot ramped, powered cargo lighters	1,593	1,616
Special base and other vessels over 100 feet	19	22
Small craft with power	505	543
72 foot Minca barges	924	1 045
Small craft without power	3 687	3,725
Service aircraft	4,504	4,771
Advanced trainer planes	5,924	6,260
Elementary trainer planes	3,686	3,686
Tanks	3,640	3,640
Self-propelled gun mounts	2,075	2,175
Carriers	29,213	30.881
Other armored vehicles	8,134	9,242
Mechanical transport	682,569	707,103
Locomotives for export (From Jan. 1, 1943)	151	151
Railway cars for export (From Jan. 1, 1943)	2,267	2,671
Communications equipment ($ millions)	329.8	336.0
Instruments ($ millions)	116.1	120.0
Machine guns and Machine carbines	371,091	379,920
Rifles and small arms	1,021,785	1,046,760
Gun barrels	66,719	67,221
Gun carriages or mountings	39,769	39,928
Small arms ammunition (including fused calibres up to 1 inch; in billions of rounds)	4.1	4.2
Pyrotechnics—units	2,537,680	3,556,337
Heavy Ammunition—Shells, empty	64,863,844	65,397,000
Shells, filled	54,910,271	57,112,000
Cartridge cases, empty	123,519,481	125,809,000
Cartridge cases, filled	58,262,720	61,711,200
Bombs and other projectiles, empty	40,549,330	42,231,000
Bombs and other projectiles, filled	28,886,028	30,843,000
Chemicals and Explosives, short tons	1,481,024	1,500,000

*These and other shipbuilding figures shown in this table are deliveries; hence the totals are lower than the launching totals.



SHOULDER TO SHOULDER
for fifty-three years

Shoulder to shoulder for over half a century, American Industry and Hyatt have worked together in the field of mechanical progress —solving ever and ever more complex engineering design problems and arriving at higher and higher precision and performance.

Today, we want to thank Industry for its generous understanding of Hyatt's wartime obligation of first serving our country. Also, we want to assure Industry that there will be compensations —for the Hyatt Roller Bearings of peacetime will reflect valuable lessons learned in the making of super-precision and super-serviceable Hyatt Roller Bearings for the tools and weapons of war.

So shoulder to shoulder, American Industry and Hyatt will continue to new heights of accomplishment. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey; Chicago; Detroit; Pittsburgh; Oakland, California.

DIVISION OF

HYATT BEARINGS **GENERAL MOTORS**

By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

Newspaper automobile editors tell engineers what the public wants in the way of postwar passenger cars. Better vision, less protruding interior hardware, uniform and stronger bumpers with less ornamentation, workable jacks among desires

SOME good, wholesome fun mixed in with a considerable amount of sound common sense on automobile body details was served up for the edification of the Society of Automotive Engineers here last week by four automobile editors from New York, Chicago, New Orleans and San Francisco, who reported results of surveys of their readership with respect to what is good and what is bad with automobile body construction.

The symposium was a bright spot in a somewhat somber meeting which, although it was called a war engineering convention, was beamed principally at postwar considerations, and the latter for the moment are not being mentioned in polite society. Only two of the 50 formal papers presented during the week had any direct bearing on war production, but this was understandable since when the SAE annual meeting was being planned the war was all but won, even in high government and military circles.

Well, what does the public find wrong with its automobiles and what does it want tomorrow. Through a generous sampling of opinion on the eastern seaboard, Bert Pierce of the *New York Times* found the greatest emphasis on vision. Slanting windshields and rear windows are not favored, nor are windshield center strips and corner posts. Vehement objection also was noted to excessive ornamentation in the form of grilles and other chrome plated trim. Desire for improved comfort in the form of more headroom, more legroom and more easily adjusted seats proved strong. There was little interest in refrigeration systems for cooling car interiors in hot weather, but definite concern over the improvement of heaters to make them more effective and instantaneous in action.

Object to Interior Hardware

Objections were voiced to all forms of protruding interior hardware on the grounds of personal safety, and there was general support for bumpers which would be of uniform height, stronger and less showy. The four-door sedan proved the most popular type of body, and black the favorite color of those polled. Drivers were nearly unanimous in their pleas to engineers to develop bodies which would be free from squeaks and rattles, and to rustproof steel body sections exposed to corrosive action.

In the field of accessories, there was almost universal desire expressed for some new form of wheel jack that would operate simply and efficiently in emergencies, the feeling being evident that present jacks are inferior equipment. Other suggestions ranged far and wide, many having already been tried at one time or another, and others being patently ridiculous.

Surveys conducted by the *Chicago Herald-American* and the *San Francisco Examiner* checked the eastern poll in considerable degree, but that supervised by the *New Orleans Times-Picayune* was strangely at variance, suggesting either inferior polling methods or that southern drivers are a different breed of cats.

Doubtless the results of these public opinion samplings will be digested with interest by those responsible for the design of motor car bodies, but it is not likely they will be taken too seriously for the industry is well aware that cars are designed primarily to sell, and thus the appearance of the product on the sales floor may be of more importance than the minor annoyance of some owner over the shape of a window lift handle. There is a certain amount of aloofness between designers and the public, the former often feeling that buyers will take whatever they, the creators, decide is good for them. The trend of body designs in the past ten years is all the proof needed to substantiate this conclusion, and little reason exists for expecting any early change.

Similar conclusions can be reached with respect to another opinion poll conducted by R. L. Polk & Co., which showed that 76 per cent of those asked will not buy a new car if its price is up 25-30 per cent from the 1942 level. This may be representative consumer sentiment, but the facts are the public will buy whatever the automobile builders offer for sale, and an increase in price will not matter much. Virtually all other commodities either have increased in price or deteriorated in quality during the war, so it is hopeless to expect automobiles to reverse this inflationary trend since their prices are geared directly to costs of production.

Returning briefly to the SAE meeting, a news report of which appears on page 46, two interesting papers on standardization—one on automobiles and one on aircraft — were presented, the first by J. H. Hunt, director of the New Devices Section of General Motors, and the second by Arthur Nutt, director of engineering, Aircraft Engine Division, Packard Motor Car Co. In the automotive field, Mr. Hunt observed logically that most standards are voluntarily used simply to obtain an economic advantage, and whenever any change in conditions makes it advantageous to change from the standard, it will immediately become obsolete. The economic advantage of a standard usually comes because it is possible to increase the volume produced by a given amount of equipment, save costs of changeover and costs of maintaining reserve stocks for manufacture and service stocks available to users. The great volume of the operations of the largest automobile producers is such that the unit saving obtainable even by a doubling of production to a given standard may

TRAILERIZED ARMY: An advantage claimed for the use of trailers in transporting antiaircraft guns and other military equipment is that the trailer can be spotted in the desired location and the tractor freed for other work. Above, a mobile ack ack gun has been towed into position and the tractor detached

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be much less than the saving available by some change in design or in practice which will involve departure from the standard.

In connection with SAE standardization activity, the 24-man executive committee of the Iron and Steel Division was among the numerous committees meeting last week to hear reports from its various panel chairmen. The division recently has been reorganized to include a number of new panels on such subjects as repair welding of gray iron, malleable iron, etc.

Outlook for new car production this year is the darkest it has been in a long time, principally as the result of a more realistic appraisal of progress in the European theater of war. Emphasis now is altogether in raising the production sights for armament and the suspicion has been voiced that it may be difficult to free essential materials even following victory in Europe.

Nonetheless there is a glimmer through the gloom, kindled by the vital necessity of maintaining essential public transportation equipment which a hard winter has deteriorated at an accelerated rate. In this category are included buses and taxicabs. Recent analysis of the taxicab situation showed that the 1944 bill for cab maintenance will exceed the cost of replacing the entire taxicab fleet with new equipment. Since manpower is the principal element in maintenance cost and since manpower shortages have become so critical, logic would dictate the building of some new cabs to replace outworn units now being patched up regularly.

National cab-operating companies such as Parmelee, Checker and Yellow normally divide their fleets into 250-car groups, but so short has the supply of cabs become that none of these is now over 90 in number, and of these 15 per cent are continually in the repair shop. These and other statistics have been furnished the WPB, together with recommendations for allocating production of taxicabs among automobile builders. Packard, for one, is interested in the proposal, but it is not considered likely the larger builders such as Chevrolet or Ford would care to participate, since their facilities are now pretty well frozen by war work, and the runs would not be large. At best, production of taxicabs would have to be somewhat of a makeshift proposition, but at least it would begin setting a few benchmarks for the eventual resumption of passenger car production by the normal assembly methods.

Completion of its third full year of "all-out" war production saw Packard in 1944 ship 57 per cent more marine and aircraft engines than during 1943, though the dollar increase in sales and billings was only 32 per cent as a result of lowered costs. Last year ended with the 55,122nd combat engine built since the start of war production, representing a total of 84,356,900 horsepower, or more than enough to power all the cars Packard has turned out in 40 years' operation.

Packard's 1944 business will exceed $450 million, out of which the federal income tax bite will be about $19 million or five times anticipated earnings. Business now on the books approximates $700 million, but there have been recent production cutbacks necessitating some layoffs. Present personnel in Detroit and Toledo plants totals 33,161, and production schedules have been projected through 1945, indications being that output for 1945, if carried through on the present basis, will be about on a par with that of 1944.

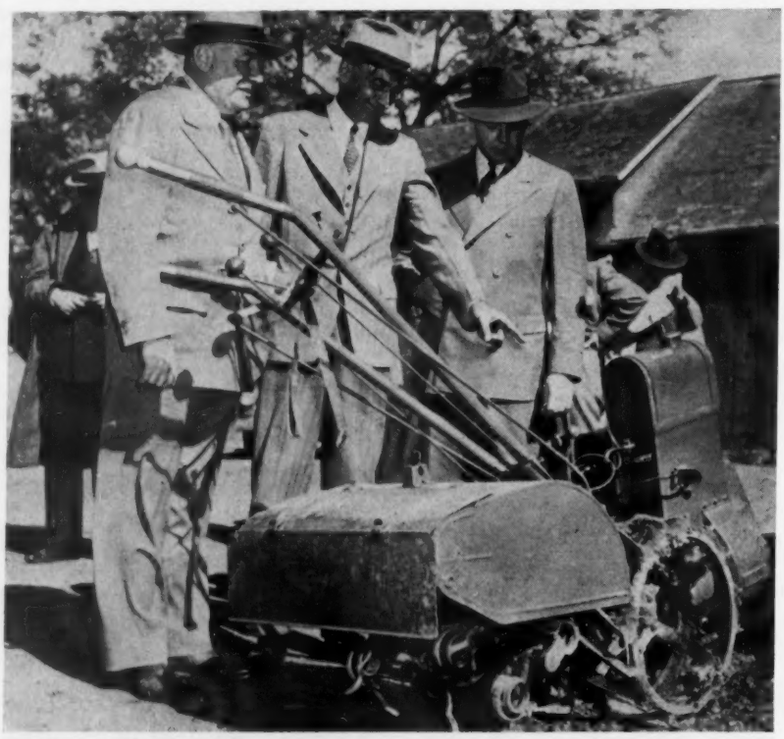
Packard employes now in the armed services number close to 8000, and throughout the past year these men have been receiving overseas personal kits, timed to arrive on their respective birthdays, with the greetings of the company and its genial president, George T. Christopher.

Estimates Re-establishment Cost

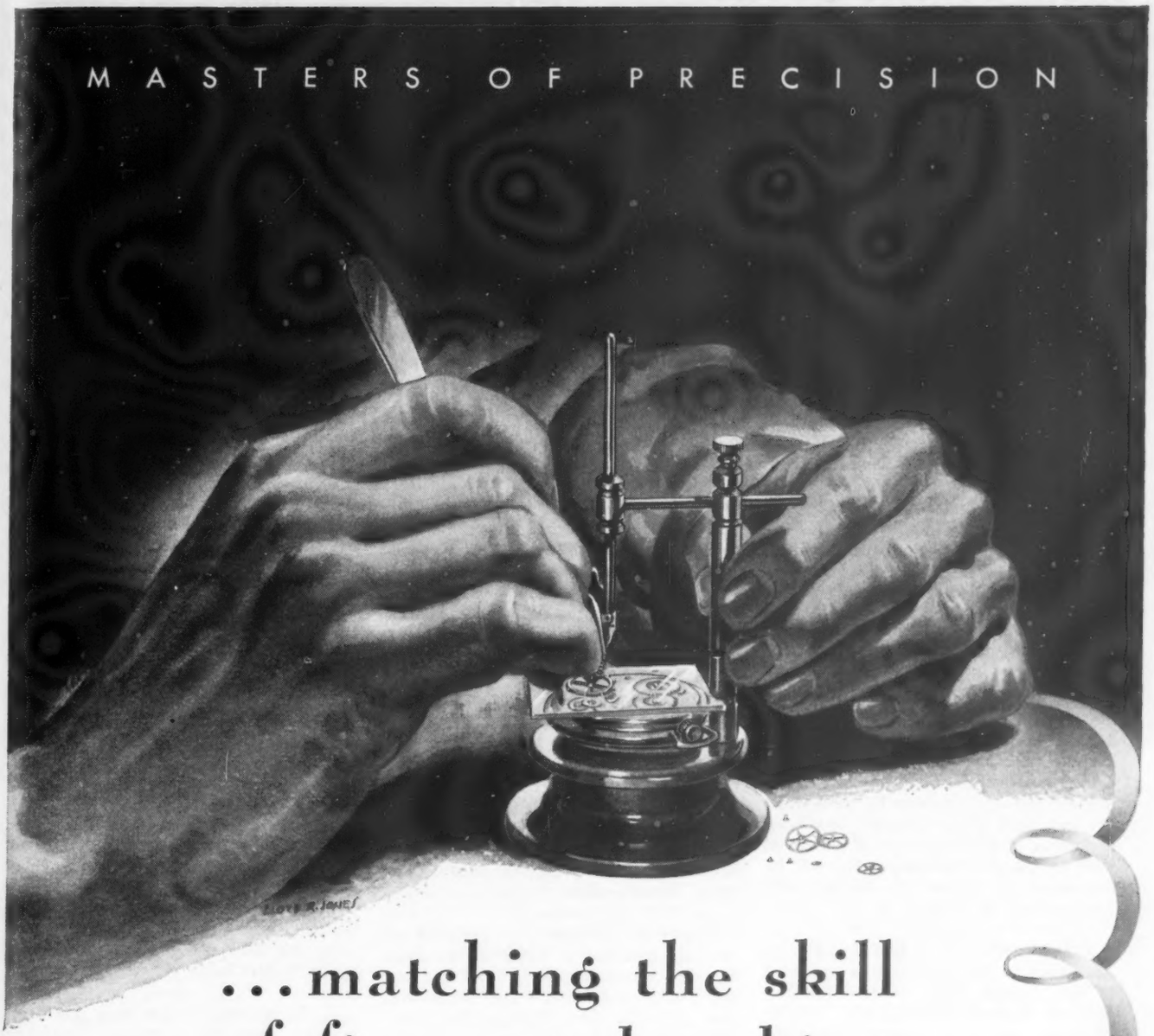
To re-establish itself in automobile manufacturing, Mr. Christopher estimates capital expenditures of $10 million will be necessary, principally for machine tools and other metalworking equipment. This is outside of the costs of relocating and reconditioning machinery incidental to reconversion.

The company has been studying postwar possibilities of its 1550-horsepower marine engine, and has come up with at least one idea of building a 6-cylinder version which would deliver 400 horsepower and be suitable for installation in 10-ton trucks. It would weigh only about 700 pounds because of the extensive use of aluminum in its construction. A number of the 12-cylinder engines may be required for replacement in motor-torpedo boats which probably will find use by the Coast Guard in the postwar period. Another suggestion which looks good is an adaptation in an airport snowplow. Proposed plow design calls for sufficient power to remove 6 inches of snow from a 7-foot swath at a speed of 7 miles per hour, the removed snow to be hurled 150 feet away from the plow.

Cadillac on Jan. 6 completed its 10,000th light tank, an M-24 mounting a 75-millimeter gun, latest in the series of three tank models built by this division; Chrysler Corp. has been permitted to announce production of 4.5-inch rocket shells, thousands of which have been supplied the Navy since the start of the program many months ago; Oldsmobile Division of GM also is producing this size rocket shell, as well as 75, 90, 105 and 155-millimeter artillery shells; Pontiac production of 155s in December exceeded contract schedules by 275 per cent, and a proposal to increase monthly schedules 25 per cent is being studied.



ROTOTILLER TO GRAHAM-PAIGE: Joseph W. Frazer, left, chairman of Graham-Paige Motors, and Raymond J. Hodgson, right, president, inspect a model of the rototiller farm machine with C. W. Kelsey, president of Rototiller Inc. Graham-Paige has obtained license rights to manufacture the machines and will begin mass production as soon as materials and manpower become available. Mr. Kelsey's company will continue to build the smaller models



...matching the skill of fine watchmaking

Each step in producing Western brass or other copper base alloys requires the painstaking precision that is used in making timepieces of finest accuracy.

The temper you specify, the tolerances, the finish, will be supplied *as ordered*—in sheet, strip, long coils or stamped parts. Western mills at East Alton, Ill., and New Haven, Conn., *produce* that way.

We have the facilities, the experience, the skill, and most important, the *desire*. Those four factors comprise a valuable combination. That combination is faithfully serving America at war, but the capacity of Western mills is such that we may be able to serve you, too, now or later. Specify Western on your next order for copper-alloy metals.

Western BRASS MILLS

Division of WESTERN CARTRIDGE COMPANY, *East Alton, Ill.*

Western BRASS PRODUCTS

WESTERN CARTRIDGE COMPANY

BRASS • BRONZE • PHOSPHOR BRONZE • NICKEL SILVER • COPPER

MEN of INDUSTRY

ARTHUR W. STEUDEL

HAROLD P. CURTIS

A. A. TACKUS

Arthur W. Steudel, re-elected president of Sherwin-Williams Co., Cleveland, has become chief executive officer under new regulations of the company. **Michael J. Fortier,** vice president and general manager of the Acme White Lead & Color Works, Detroit, a Sherwin-Williams subsidiary, has been elected a board member and appointed vice president and executive assistant to the president of Sherwin-Williams. **Gordon H. Robertson,** formerly general industrial sales manager at Sherwin-Williams, takes Mr. Fortier's position at the Acme company. **Gustave L. Hehl,** eastern industrial sales manager, has been appointed general manager of industrial sales by Sherwin-Williams. He will be succeeded by **Milton A. Kindig** with headquarters in Newark, N. J.

—o—

P. L. Barter has been named vice president next to the president in operation of the McCord Corp., Detroit, formerly McCord Radiator & Mfg. Co. **W. G. Hancock** has been elected vice president in direct charge of operations. **James H. Cooper** is now works manager for all McCord plants.

—o—

H. C. Allington, sales research engineer in charge of development and expansion of markets for Wickwire Spencer Steel Co., New York, has been appointed assistant general sales manager of the company and its subsidiary, American Wire Fabrics Corp.

—o—

F. E. Neveu, general foreman of the St. Paul plant of the United States Steel Supply Co., has been appointed superintendent of that plant, succeeding **Austin E. Slattery,** retired.

—o—

Mason Britton has succeeded **W. L. Clayton** as Surplus War Property Administrator until the recently appointed Surplus Property Board takes office.

—o—

Harry R. Kluth, district manager at Philadelphia for the Pittsburgh Plate Glass Co., has been appointed general manager of the firm's 77 warehouses, succeeding **Frank Clarke** who goes to Brooklyn as warehouse manager and eastern manager. Mr. Kluth will be succeeded in Philadelphia by **H. E. Zoll** who has been doing special industrial relations work in the company's general office at Pittsburgh. **William H. Marsh,** paint manager at Philadelphia, has been named assistant manager of the Philadelphia warehouse.

—o—

Harold P. Curtis, Pacific coast manager of fabricated stainless steel sales for the Edward G. Budd Co., Philadelphia, has been appointed Pacific coast manager for the Rustless Iron & Steel Corp., Baltimore. His office will be at Los Angeles. Mr. Curtis succeeds **Thomas L. Moore** who last spring was made manager, western sales.

—o—

Emory L. Johnson has resigned as foundry manager of Farrel-Birmingham Co. Inc., Ansonia, Conn., and has become sales and foundry consultant with the Malleable Iron Fittings Co., Branford, Conn.

—o—

S. L. Mather has been named vice president in charge of mining operations of the Cleveland-Cliffs Iron Co., Cleveland, succeeding **Max H. Barber,** retired.

—o—

Walter W. Bertram has been elected vice president in charge of sales and **Robert J. Howison** is sales manager, Morse Chain Co., Ithaca, N. Y., and Detroit. The company is a division of Borg-Warner Corp.

—o—

L. T. Beecher, chairman of the board, Southern States Iron Roofing Co., Savannah, Ga., has retired after nearly 50 years in the steel business.

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Willard M. Robinson, formerly open hearth superintendent of Wickwire Spencer Steel Co., Buffalo, has joined Joseph Dixon Crucible Co., Jersey City, N. J., as field representative in the Pittsburgh and Valley districts.

—o—

Harold L. Gobeille has been appointed manager of marine traffic, Cleveland-Cliffs Iron Co., Cleveland, and **Capt. Carl O. Rydholm** has been named marine superintendent. **A. E. R. Schneider** is retiring as manager of the marine department after 42 years with the company.

—o—

A. A. Tackus, associated with Aviation Corp.'s Republic Aircraft Products Division, Detroit, has been appointed assistant to the executive vice president, succeeding **John E. Stanton** who has been transferred to American Central Mfg. Corp., Connersville, Ind., as assistant to the president.

—o—

N. E. "Ned" Dawson, vice president and general manager of the Los Angeles plant of the Soule Steel Co., has retired from active duty after having served the company and its predecessor concerns for 28 years. He is succeeded by **E. B. McClure.**

—o—

C. E. Murray, former vice president, is now president, Crescent Insulated Wire & Cable Co. Inc., Trenton, N. J.

—o—

Andrew Kaul III has been elected president of Speer Carbon Co., International Graphite & Electrode Corp. and Speer Resistor Corp., St. Marys, Pa.

—o—

A. Bruce Hunt, formerly regional director of the President's Committee on Fair Employment Practice in the southwestern states, has been promoted to fill a newly created position as western counsel to the committee with offices in Los Angeles. Dr. Witherspoon Dodge has been appointed regional director to succeed Mr. Hunt.

—o—

Owen D. Young and **Gerard Swope** have resigned as directors of the General Electric Co., Schenectady, N. Y.

—o—

Frank P. Rhame, a director and vice president of Lunkenheimer Co., Cincinnati, has been made general manager, succeeding **Charles A. Brown,** who retired Dec. 31. **Homer E. Lunken,** a director, succeeds Mr. Rhame as assistant general manager. **Carra L. Lane** has

been named works manager, succeeding **George A. Seyler,** who retired as vice president in charge of manufacturing Dec. 31. **Fred H. Hehemann** becomes chief engineer, succeeding **Jerome J. Aull,** who retired Dec. 31 after nearly 50 years with the company.

—o—

Richard H. Diesel, for the past three years manager, war contract service department, Stamford Division, Yale & Towne Mfg. Co., Stamford, Conn., has been appointed manager of aircraft and automotive sales, with office at 2679 East Grand boulevard, Detroit.

—o—

Earl R. Rattray has been made fleet engineer, Pittsburgh Steamship Co., Cleveland, subsidiary of United States Steel Corp. Mr. Rattray succeeds **James F. Wood,** who is retiring after 44 years with the company.

—o—

Morgan D. Douglas has been elected vice president and becomes general manager, Truck & Coach Division, General Motors Corp., Pontiac, Mich. He succeeds **Irving B. Babcock,** resigned. Mr. Douglas has been general parts and accessories manager of the Chevrolet Motor Division since 1929, general manager of the General Motors Parts Division since 1933 and director of parts distribution for General Motors war products.

—o—

Sidney M. Robards has been appointed manager, department of information, Radio Corp. of America, New York.

—o—

Howard W. Gilbert has been appointed engineering assistant to the president of National Malleable & Steel Castings Co., Cleveland, in charge of specialty engineering, development and testing.

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Jack Geartner, formerly with Emerson Radio & Phonograph Corp., New York, has been appointed sales manager for Electronic Corp. of America, New York.

—o—

H. J. Hogue has become president of Wasmer Bolt & Screw Corp., Cleveland, succeeding **John C. Wasmer,** who sold his interest in the firm to officers and associates, continuing as treasurer. **J. S. Rignall** becomes vice president, **M. A. Gardner,** vice president in charge of sales, **G. L. Howard, secretary** and **J. L. Auer,** general superintendent.

—o—

Andrew K. Barr, foundry specialist in the Los Angeles district headquarters of OPA, has resigned to enter private industry, and is succeeded in the OPA post by his son James. The elder Mr. Barr formerly was head instructor at the Great Lakes Naval Station foundry, and prior to that was president, Waukegan Foundry Co., North Chicago, Ill.

—o—

L. M. Parsons has been appointed assistant to **Avery C. Adams,** vice president-sales, United States Steel Corp., Pittsburgh. Mr. Parsons will be located in Washington. He was associated with Bethlehem Steel Corp., Bethlehem, Pa., for many years, becoming district manager of sales at Philadelphia in 1936. Two years later Mr. Parsons became vice president and general manager of sales, Jones & Laughlin Steel Corp., Pittsburgh, resigning recently.

—o—

Frank J. O'Brien has been elected president, Metal & Thermit Corp., New York, succeeding **F. H. Hirschland,** president since 1922, who becomes chairman. Until recently Mr. O'Brien served for many years as vice president of Continental Can Co. Inc., New York. **E. Becher** has retired as first vice president of Metal & Thermit.

—o—

Jack T. Dalton has been appointed eastern district manager for the New York territory, Bendix Radio Division, Bendix Aviation Corp., Baltimore. He was formerly eastern sales manager for Crosley Corp., Cincinnati, and Grigsby-Grunow.

—o—

Stanley Szacik has been promoted to assistant superintendent of the cold drawn department of the Dunkirk, N. Y., plants of Allegheny Ludlum Steel Corp., Brackenridge, Pa. **Anthony Passafaro** is superintendent now of hot rolling mills and hammers at both the Howard avenue and Brigham road plants at Dunkirk. **Emil H. Forsstrom** has become assistant superintendent of the Brigham road plant, and **William K. Powers** is now assistant superintendent of hot rolling mills at that plant.

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Orville R. Lyons, formerly of Battelle Memorial Institute, Columbus, O., has been appointed preparation engineer in northern coal mines of Republic Steel Corp., Cleveland.

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Thomas F. Dorsey, for the past ten years sales manager of Fort Pitt Steel Casting Co., McKeesport, Pa., has been named a special representative for the Pittsburgh Steel Foundry Corp., Glassport, Pa.

—o—

E. P. Harter has been named sales representative in western New York for Universal-Cyclops Steel Corp., Bridgeville, Pa. Also appointed are: **W. D. Fisher,** special representative in Detroit; **R. A. B. Williams,** Pacific Coast representative, and **Richard H. Dexter,** sales representative in Rhode Island.

—o—

Dr. Eugene W. Kanning has been appointed director of research for the Arco Co., Cleveland, and **Dr. Robert J. Hartman** has been named director of that company's Industrial Division. Both have been associated with the Dow Chemical Co., Midland, Mich.

—o—

F. Q. Murphy has returned as manager of the Atlantic region for the Oldsmobile Division, General Motors Corp. Other changes are: **L. J. Blunden,** central region manager; **Russell Lesher,** Chicago zone manager; **R. L. Myers,** Oakland, Calif., zone manager; **A. J. Mutschler,** Dallas, Tex., zone manager; and **E. W. Alexander** and **L. H. Brown,** assistants to Mr. Mutschler, located in Houston, Tex., and Oklahoma City, Okla., respectively.

—o—

H. R. Salisbury, former excutive secretary of the postwar planning committee of Air Reduction Co., New York, has been named president of Airco Export Corp., which has been organized to expand, consolidate and direct the export business of Air Reduction and its subsidiaries. **L. A. Hull,** vice president of Air Reduction, has been elected chairman of the export company.

—o—

Earl I. Turner, formerly of the By-Products Steel Corp., is now associated with the Cleveland branch of Luria Bros. & Co. Inc., Reading, Pa.

—o—

Robert B. Thomson has been appointed tool engineer, Kennametal Inc., Latrobe, Pa. He will be assistant to Kennametal's chief engineer and responsible for subcontracting.

—o—

Wendell A. Melton has been appointed district manager in charge of the Tulsa, Okla., office of the Foxboro Co., Foxboro, Mass.

—o—

John M. Olin succeeds his father, **Franklin W. Olin,** as president of the Western Cartridge Co. group of industries now included in the merged corporation, Olin Industries Inc., East Alton, Ill. The new president is succeeded as first vice president by his brother, **Spencer T. Olin.**

—o—

J. E. Smith, formerly with the Western Electric Co. at Kearny works, Kearny, N. J., is now foreman of the fabricated parts department of Wickwire Spencer Metallurgical Corp. at Newark, N. J.

—o—

C. V. Coons, sales manager of the Eastern Container Division of Rheem

FREDERICK C. TEUTEBERG

Who has been named treasurer, United States Steel Supply Co., Chicago, reported in STEEL, Jan. 8, p. 70.

Mfg. Co., has been promoted to assistant director of sales of both the Appliance and Container divisions of the company. **George W. Knight,** assistant to Mr. Coons, succeeds the latter as manager of the Eastern Container Division, and **E. W. Manstrom,** recently discharged from the Army, will assist Mr. Knight.

—o—

Paul R. Baker, sales manager for Apex Machine & Tool Co., Dayton, O., has taken over Michigan representation for that company, with Detroit as his headquarters. **Harry G. Fischer,** formerly purchasing agent and head of the Apex order department, succeeds Mr. Baker as sales manager.

—o—

Marcus E. Borinstein, for the past 30 months chief of the Scrap Subsection, Scrap and Salvage Section, Redistribution Salvage Branch, Office of Chief of Ordnance, War Department, Washington, under **Lt. Col. Lowell Thomas,** has become associated with Erman-Howell & Co., Chicago. He will handle government bids, nonferrous metals and ferrous scrap.

—o—

E. F. Hatch, assistant director of the War Production Board Ferroalloy Branch, Steel Division, has returned to his own work as consulting engineer.

—o—

C. Harvey Bradley, president, W. J. Holliday & Co., Indianapolis, has been elected vice president of the Chamber of Commerce in that city.

—o—

J. F. Considine has been appointed assistant district manager of the Chicago plant of American Car & Foundry Co., and **W. C. Roederer** has been named assistant district manager of the company's plant at St. Charles, Mo.

—o—

Forrest L. Grossman, controller of the Chicago Bridge & Iron Co., Chicago, and **Marshall W. Sheridan,** controller of the United States Steel Products Co., New York, have been elected members of the Controllers Institute of America, New York.

—o—

Lou Boudreau, playing manager of the Cleveland Baseball Co. (the Indians) has joined the personnel department of Whiting Corp., Harvey, Ill.

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Gordon W. Reed, industrialist and former War Production Board official, has been elected a director of the Apex Smelting Co., Chicago.

—o—

Clinton R. Hanna, inventor of the tank-gun stabilizer, has been named associate director of research laboratories of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

—o—

Joseph L. Sheeketski has left the Federal Bureau of Investigation to become assistant district manager of the Cleveland territory for Peninsular Grinding Wheel Co., Detroit.

—o—

W. Spencer Robertson has been elected chairman and **Henry W. Foulds,** president, of the Permutit Co., New York.

—o—

R. G. Ervin Jr., manager of the Evansville, Ind., modification center for Republic Aviation Corp., has become material director in charge of all procurement, material control and stores activities of Kellet Aircraft Corp., Upper Darby, Pa.

—o—

Dewey E. Narkates, engineering and construction department of Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., has been named assistant to director of public relations of that company.

—o—

John B. Tinnon and **Walton S. Smith** have been elected directors of Metal & Thermit Corp., New York, of which they are vice presidents.

—o—

Organizational changes in the apparatus department, General Electric Co., Schenectady, N. Y., have been announced as follows: **H. V. Erben,** commercial vice president and manager of the company's Central Station divisions, becomes assistant general manager, apparatus department; **C. H. Lang,** vice president, is manager of sales; **H. A. Winne,** vice president, is manager of engineering; **Neil Currie Jr.** is manager of manufacturing; **Guy S. Hyatt,** assistant comptroller, is in charge of accounting and **W. W. Jenkins** is counsel.

—o—

R. J. Herbenar recently joined the Craine-Schrage Steel Division of Detroit Steel Corp., Detroit, as chief metallurgist.

—o—

William M. Russell, sales representative in the Detroit and Cleveland areas for Monsanto Chemical Co., St. Louis, has been appointed branch manager of the Monsanto Organic Chemicals Division for the Detroit territory.

OBITUARIES . . .

Walter H. Girdler, 58, president of Tube-Turns Inc. and Girdler Corp., Louisville, Ky., died Jan. 7 in that city.

—o—

J. Vion Papin, 68, for many years editorial representative of STEEL in the St. Louis district, died Jan. 2 in Barnes hospital, St. Louis. Mr. Vion Papin at one time was head of the statistics department of the St. Louis Federal Reserve Bank and prior to that served on the editorial staffs of various St. Louis newspapers, including the old *St. Louis Republic* and the *St. Louis Post-Dispatch.* He was a member of one of the oldest French families in the St. Louis area and his home in Ste. Genevieve, Mo., is one of the historical show places of Missouri.

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Lewis Clifford Kenyon, 57, for 25 years New York branch office manager, Heald Machine Co., Worcester, Mass., died Jan. 9 in Summit, N. J.

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Chris Borg, 85, who directed construction of International Harvester Co. plants in Chicago and foreign countries as general works manager from 1910 until he retired in 1921, died Jan. 3 in Chicago. A native of Denmark, he started as a metal patternmaker with Deering Harvester Co., Chicago, in 1880, at which time the plant's machinery included only three lathes.

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George Remnsnider, former vice president, Modern Machine Works and founder of Ideal Stencil Machine Co., St. Louis, died recently in Belleville, Mo.

—o—

Fred J. Hartmann, 55, assistant secretary-treasurer, Harnischfeger Corp., Milwaukee, died there Jan. 5.

—o—

William J. McCormack, 51, a control engineer in the Defense Plant Corp., New York, died there Jan. 4.

—o—

B. J. Thompson, 40, associate research director, Radio Corp. of America laboratories, Princeton, N. J., and expert consultant in office of Secretary of War, was killed in an Army airplane accident in the Mediterranean area on July 4, it has just been announced by the War Department.

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Raymond L. Haskell, 52, manager, Cleveland magnesium sand foundry of American Magnesium Corp., and pioneer in magnesium fabrication and nationally recognized authority on magnesium casting processes, died at Cleveland, Jan. 5.

—o—

John F. McLachlan, 47, mechanical engineer for the Chile Exploration Co., subsidiary of Anaconda Copper Mining Co., New York, died in that city Jan. 3.

—o—

John L. Beven, 58, president of Illinois Central railroad, died Jan. 3 at Clinton, Ill.

—o—

Henry H. Pease, 68, vice president and secretary, Lehigh Coal & Navigation Co., died Jan. 4 at his office, Philadelphia.

—o—

Raymond J. Blyth, 52, formerly personnel director for Warner & Swasey Co., Cleveland, died Jan. 2 in Tucson, Ariz.

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William P. Casey, sales engineer in Buffalo for Industrial Furnace Division of R-S Products Corp., Philadelphia, died in Buffalo Jan. 3.

—o—

William H. Schulte, 60, assistant chief engineer, National Engineering Co., Chicago, died in that city Jan. 4.

Holds Prompt Disposal of Excess War Plants Essential to Stability

Industrial liquidating and dismantling engineer says many companies may find themselves in precarious postwar position unless unproductive idle facilities are quickly disposed of. Financial burden too great to carry

REALISTIC approach to the problem of disposing of surplus war plants, both private and government-owned, is advocated by Russell R. Hetz, general manager, Hetz Construction Co., Warren, O., industrial liquidating and dismantling engineer.

If prompt and complete liquidation of such facilities is not made soon after they become unproductive, Mr. Hetz believes the owners may find themselves in a precarious position by having the expense of idle property on their hands. The unprecedented demand during the past few years for anything with four walls and a roof, he says, has "warped our sense of values and makes taking a realistic view more difficult."

Mr. Hetz believes there is a socialistic movement supporting the views of Sen. Pat McCarran (Dem., Nev.) on the decentralization of heavy industries. This decentralization plan, based on the distribution of industries on a per capita basis, is regarded as "smart politics" and already has gained considerable favor in the less industrialized areas.

The speed with which companies dispose of their surplus facilities will, in many cases, determine its postwar competitive position, he believes, because in many cases the idle works expense is so great that it will bring about eventual ruin if prompt disposition of the properties is not made.

"No company is rich enough to afford the luxuries of carrying unproductive plants," said Mr. Hetz.

"The experience of thousands of industries, which in the past had been burdened with idle works expense, should not be disregarded. With a fair percentage of the plants we purchase for liquidation, we inherit a two-foot stack of correspondence with innumerable letters from promoters who paint glowing pictures of adaptation of the property for all kinds of uses. The only catch is that the owner is to continue to take all the risk and at the same time yield control of the plant to the promoters," Mr. Hetz warns.

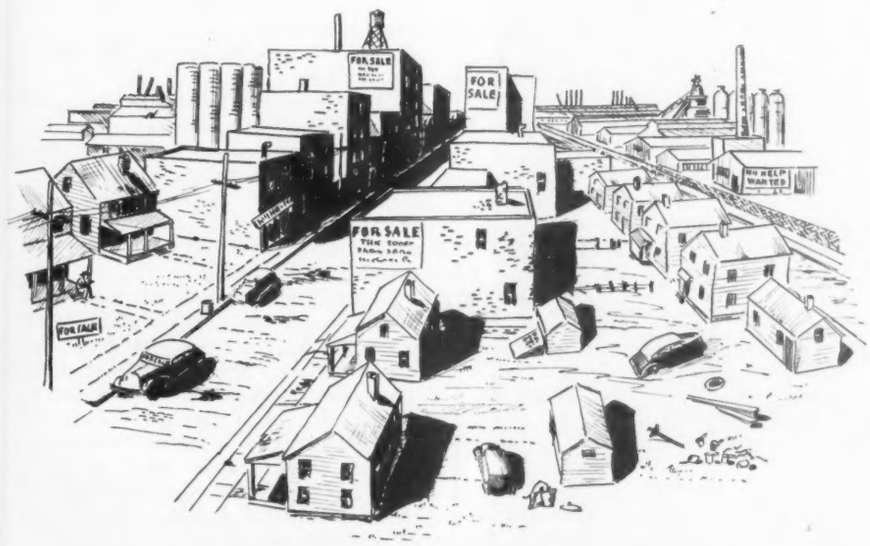
"During the period of early idleness of the plant, a considerable portion of the owner's time and energy is diverted from normal duties to sideline excursions into real estate and idle property problems. Idle works expense, insurance, temporary repairs and other expenses accumulate. The silent forces of disintegration and obsolescence are on a 24-hour shift, 365 days each year," he added.

Mr. Hetz points out that there is no standard plant and a plant built to the peculiar requirements or whims of one industry is not readily converted to those of another industry. Naturally, any prospect carefully calculates the increased cost of operating in buildings which are too high or too low or too costly to heat or for dozens of equally good reasons. Another great factor is that the same desire which motivates every man to build a home to his own specifications also is even manifested more strongly in building an ideal plant, one which exactly suits the owner's flow of production and his artistic temperament. Experts can prove that a slight "hitch" in a production line, or the extra cost of heating a building with a ceiling two feet higher than necessary, will over a period of years eat up the spread between cost of an old and a new plant.

The danger of a plant owner liquidating his surplus property without the aid of an expert is emphasized. The loss which a company takes in placing its property in the hands of a liquidator is more than offset by the elimination of the overhead expenses of carrying unproductive property, according to Mr. Hetz.

With the increased cost of labor, plus the fact that many of the expenses such as insurance are based upon payroll figures, the incentive to tool a factory with labor-saving devices, as well as build efficient plants that will cut down production costs, places emphasis upon the necessity of appraising an idle plant problem in a realistic manner. This means that there will have to be a shorter life of usefulness of any building, Mr. Hetz said. It also means that its adaptability and desirability to another concern is necessarily lessened. Records of many of our sales for industrial relocation reflect that many of the sales were made to concerns in their infancy where the problem of survival was very important.

"If used buildings are priced attractively enough, a small concern can occupy them, but as pointed out, the price must be sufficiently attractive to offset the advantages that would be incorporated in a new building program designed to exactly fit the industry's requirements. Experience has shown that these small concerns can occupy these buildings through infancy, but when they reach the adolescent stage, they become efficiency-minded and want to move from the buildings possibly for the same reason they were originally abandoned. It may be possible that postwar relative positions may be decided to a large extent by the realistic treatment given their idle plant facilities. Many concerns will find that they cannot afford the diversion from normal duties to sideline excursions into real estate activities that a liquidation by their own executives would involve," Mr. Hetz concluded.



With decentralization of industry being actively advocated in Congress many politicians in the postwar period are likely to seek to advance their economic views by capitalizing on the plight of so-called "dead-end cities"

Ex-servicemen To Be Aided In Return to Civilian Jobs

A program for returning ex-servicemen to civilian employment has been adopted by Weirton Steel Co., Weirton, W. Va. It will be administered by the new servicemen's information and induction division, a part of the industrial relations department.

WING TIPS

Harvard University Business School study indicates average airframe manufacturer will be able to survive immediate postwar adjustment period if proper preparations are made by the companies and the government

SURVEYING postwar deflation and conversion problems of the aircraft manufacturing industry, a Harvard University Business School study concludes the average airframe manufacturer will be able to survive the immediate postwar adjustment period with a reasonably satisfactory financial position on three conditions: (a) If contract terminations are administered with a reasonableness consistent with the broad policies set forth in the Contract Termination act of 1944; (b) if the company sets up its own administrative organization to handle terminations properly, concentrating prior to the end of the war on effective inventory management and (c) if the management curtails expenses realistically and rapidly.

Authors of the study, Prof. Tom Lilley and L. L. Horton, used projected financial statements of ten leading airframe manufacturers for 1945 and 1946, and assumed for the purposes of their analysis that large-scale military aircraft production will cease in December, 1945. The authors were members of the Harvard group which prepared the excellent report on disposal of surplus aircraft submitted to the Senate last summer.

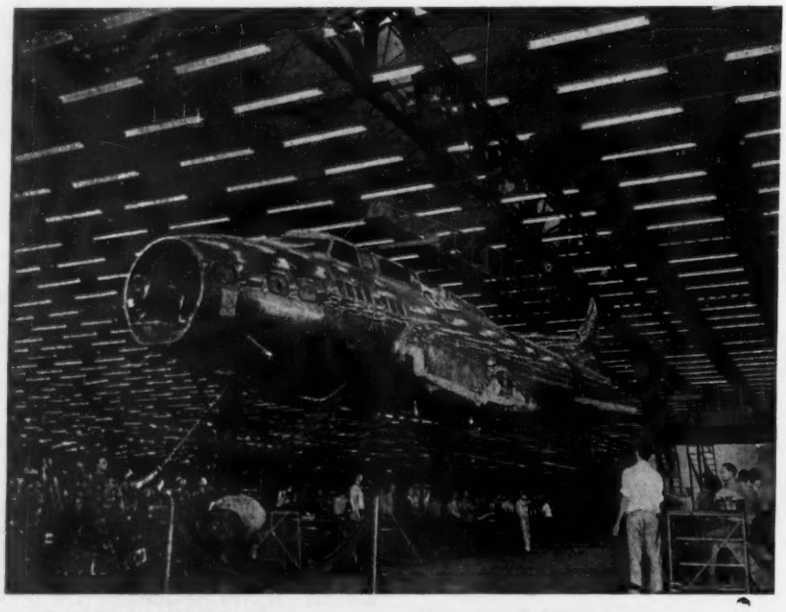
Examining the three conditions cited above, the report continues, in part: "The progress made during the last year in planning for contract terminations and conversion affords some grounds for optimism that these conditions may be fulfilled. The risk is great, however, that uncertainties and delays during the conversion period will unnecessarily impede the constructive developmental work required to promote maximum peacetime production.

"Entirely apart from termination and tax problems, the basic question facing each aircraft manufacturer is: Conversion into what? The answer will be vitally affected by the postwar aviation policies adopted by the government, including policies for Army-Navy procurement, plant and equipment disposal, and Civil Aeronautics Board certification of new transport routes.

"A danger still exists that the lack of co-ordinated industry and government preparations and the sheer mechanics of contract termination procedures will so delay conversion that future employment and development will be harmed.

"Based on favorable assumptions, it is estimated that net termination losses for the average airframe manufacturer would be about $1,100,000 or 1 per cent of total inventories, and that unreimbursed expenditures in 1946 would be $11,200,000 or 2 per cent of war peak annual expenses. In spite of these cash outlays, profits retained during 1944 and 1945 and the conversion of the postwar tax refund into cash could increase net working capital from the December, 1943, level of $18,100,000 to $23,600,000 in December, 1946. This working capital should be sufficient to meet reasonable contingencies and, if no further decreases occur, to finance adequately postwar sales at a level equal to 10 per cent of war peak sales. In addition, if the loss carryback provision of the tax law remains in effect, tax refund claims would be about $9,600,000. Under the present law, however, these claims cannot be considered as a current asset because they are not likely to be converted into cash until several years hence.

"If the unreimbursed expenditures during the first postwar year reached a level of $29,000,000, equivalent to less than three weeks' expenses at the early 1944 rate, all the average company's cash would be eliminated, even though termination settlement losses remained at the assumed $1,100,000 optimistic level. Or if the unreimbursed expenditures remained at the optimistic level, all cash would be eliminated by termination losses of $18,900,000, or 17 per cent of total inventories. Under either set of assumptions, net working capital would decrease to $5,800,000, and the company would face a serious threat of insolvency. The chances of obtaining bank credit would probably be remote, in spite of large loss carryback and other tax claims."



OVERHEAD CONVEYOR: A crane carries a B-17 fuselage over the assembly line at the Lockheed Aircraft Corp., Burbank, Calif.

Aluminum Sheet Shortage Threatens Plane Output

Production schedules of B-29 Superfortresses and other aircraft and equipment are threatened by an impending shortage of sheet aluminum in the first quarter of 1945, according to the Air Technical Service Command.

The shortage, ATSC pointed out, concerns not only Army Air Forces production, but also production of Navy airplanes and equipment for other arms of the services.

Maj. Gen. K. B. Wolfe, chief of engineering and procurement, ATSC, emphasized that the shortage is not due to lack of producing facilities or of raw materials, but of labor.

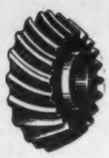
He reported the Aluminum Co. of America, largest producer of aluminum sheet, is operating at only 70 per cent of capacity, entirely because of a shortage of labor.

"The aluminum sheet shortage could be overcome if aluminum mills had enough labor," General Wolfe said. "But manpower is the tightest factor on the production front. The real cause of the shortage is founded on the optimism most of America shared during the past summer and early fall."

General Wolfe disclosed that many manufacturers, anticipating cutbacks of contracts in the wave of optimism, dipped into their reserve stocks of aluminum sheet so that they would not be caught with large surpluses when the expected cutbacks or terminations came.

Then, because their orders to aluminum sheet mills declined, the mills had to reduce their operations and let labor go to other employers.

"What many people overlooked is that the war is still far from over," General Wolfe declared. "Instead of terminations, contractors are getting increased



SUNICUT improves finish of gears... tool life increased from 8 to 20 pieces

The outstanding progress of metal working in the aviation industry may be credited to the ready adoption of new and better methods. This is especially true in cutting lubricants!

Short Tool Life and inferior finish were slowing production in a plant machining airplane gears. Several well-known cutting lubricants were used up to seven months ago. Then a Sun Cutting Oil Engineer stepped in, studied operating conditions and recommended Sunicut.

Output increased 150% per tool grind. With Sunicut they increased tool life from a previous average of 8 pieces per tool grind to 20 pieces. Results . . . longer tool life . . . improved quality of finish . . . less time lost for tool resetting.

Experiences of operators of machine tools prove the production value of Sunicut — developed to make tools hold their edges longer, cut faster and produce better finishes. Put this transparent, free-flowing, sulphurized cutting lubricant to work in your shop. Write for details to . . .

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orders. Now, because they allowed their minimum reserves to fall below a safe operating level, manufacturers are calling on aluminum sheet mills to produce considerably more than was previously estimated.

"The mills are there, the raw materials are there, but the labor is gone—and the mills are having a tough time getting it back."

General Wolfe pointed out that the current aluminum shortage emphasizes that American industry cannot safely reduce its stocks beyond normal flow-time needs in anticipation of the end of the war.

"We are going to have to expect and accept surpluses," he said. "We must choose between maintaining adequate production levels to speed the end of the war or, by juggling available materials against war needs, gamble with the lives of our men and run the risk of prolonging the war."

The impending shortage was brought on by an overall increase in demand from the armed services for aluminum sheet. AAF requirements have increased as a result of accelerated production schedules for the B-29, B-24, P-47, CG-4 glider, and for large droppable fuel tanks for fighter planes. The Navy Bureau of Aeronautics also has scheduled accelerated production of equally high priority planes and projects.

Fisher Body Completes 5000 Nacelles for B-29s

More than 5000 engine nacelles for the B-29 Superfortress have been shipped from the East Side plant of the Fisher Body Cleveland Aircraft division.

Comprising more than 3000 parts, the nacelle for the B-29 is larger and more complex than on any other plane. It houses not only the engine, but all power plant auxiliary equipment, including turbosuperchargers, electrical lines and control for fuel, oil and carburetors, intercooling systems, heaters and filters.

Each nacelle weighs approximately one ton and is nearly 12 feet long and 7 feet high, with more than 1300 subassemblies, plus hundreds of feet of wiring and aluminum tubing. One set of nacelles constitutes nearly 20 per cent of the entire plane's construction.

The No. 1 Fisher Body plant in Cleveland at peak production was able to turn out automobile body parts at the rate of 5000 cars a day. At that time, 34 months ago, the B-29 bomber was only in the blueprint stage, but within four months the plant had undertaken the task of building all engine nacelles for the entire 1943 production program.

Conversion of the six-story plant began in April, 1942. More than 1,000,000 square feet of floor space was made available for the B-29 program and immediately began the work of removing automotive equipment which could not be used in the aircraft program. Thousands of tons of parts and materials were disposed of or stored, including 17,000 tons of steel, some of which went to Russia under lend-lease. A total of 4,301,456 metal body parts was scrapped and turned into steel for war use.

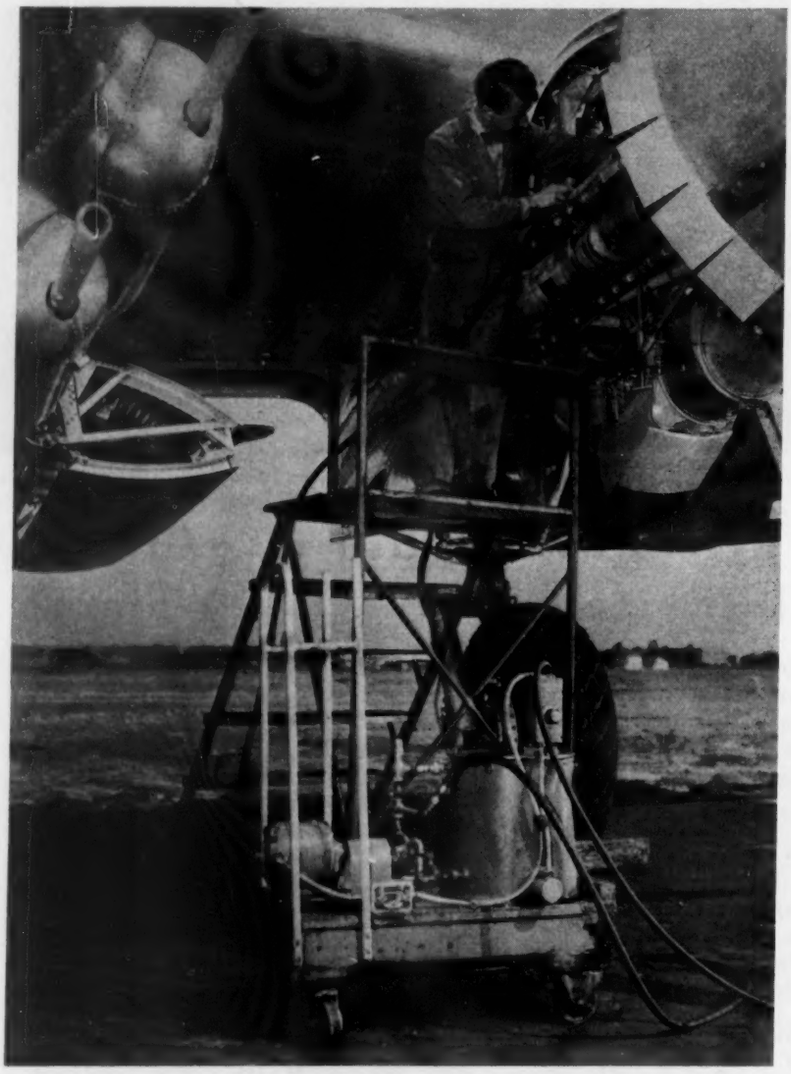
Machinery and equipment which could be used in the B-29 program was retained. The remainder was made available to other plants which could use such equipment.

Available to get the new program under way was little in the way of aircraft equipment, but one thing that was available was the nucleus of a capable supervisory staff with production "know-how." In addition, several hundred supervisors were given special aircraft assembly training, many of these men being former production workers in the automobile body days. Training of supervisory groups began in May, 1942.

More than 18,000 jigs, fixtures, tools and dies were required to begin the production program and construction of these was well under way by July, 1942. Fabrication of the first parts for the B-29 nacelles began in Aug. 20, 1942, and the first subassembly operations were begun in December.

Manpower presented a serious problem. From an employment total of 3800 in 1941, the B-29 production schedule called for an increase of nearly 300 per cent.

The first completed nacelle was accepted by the AAF on April 15, 1943, and two days later the first two completed nacelles were shipped. By August the plant was turning out one complete set of four nacelles a day and this had been doubled by October. Today the plant is turning out 28 nacelles a day, or seven sets.



PRE-OILER: This compact, portable pre-oiler, which delivers pre-heated oil under pressure to the engines of the B-26 Marauders assuring complete removal of all preservative compound and thorough lubrication of all parts before their initial run-up, was developed by engineers of the Glenn L. Martin Co., Baltimore, as a result of an Army order specifying the use of heated oil in the pre-oiling of engines

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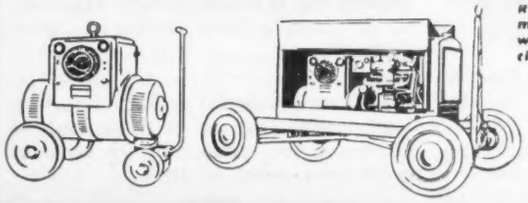

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Army's Ordnance Chief Honored by Arms Industry

Tribute is paid Maj. Gen. L. H. Campbell Jr. by 1300 members of small arms and ammunition industry

THIRTEEN hundred representatives of the modern small arms and ammunition industry honored Maj. Gen. Levin H. Campbell Jr., chief of ordnance, United States Army, and observed the industry's fifth anniversary at a dinner recently at the Waldorf Astoria Hotel, New York.

General Campbell, in reciting the achievements of an industry which employed but 5000 people in 1939, stated that in four and a half years it has produced 19 billion .30-caliber cartridges, eight and a half billion .50-caliber cartridges, seven billion rounds of pistol and carbine ammunition, and three billion rounds of rifle ammunition for lend-lease, besides 1,700,000 .50-caliber machine guns, 11 million rifles and carbines, and four million pistols, rifles and machine guns.

He warned that the increased tempo of war demands higher production and said approved requirements this year call for production of 375 million .30-caliber cartridges a month, 250-million .50-caliber cartridges, and 175 million rounds of pistol and carbine ammunition.

Rear Adm. George F. Hussey Jr., chief of the Bureau of Ordnance, United States Navy, revealed the new budget of the bureau for small arms and ammunition in 1946 is $180 million, more than three times the total appropriation of the bureau in 1939.

Thomas J. Watson, who presided, spoke for the 450 prime contractors, the 350 suppliers, and the 6000 subcontractors composing the industry in acknowledging the co-operation and assistance offered by General Campbell and the ordnance department in achieving mass production of arms and ammunition.

"During a recent twelve-month period the industry started producing 24 new types of small arms, weapons and ammunition. The industry employs approximately 3 million people. While meeting the test in providing overwhelming superiority of materiel, it has also greatly reduced the necessary labor to maintain production at a high level and, at the same time, cut costs. The cost of producing small arms and ammunition today is approximately half what it was in 1941."

Charles L. Horn, president, Federal Cartridge Co., declared that at the outbreak of war, the ordnance department called upon the arms and ammunition industry to build for government needs.

Association Is Formed in Material Handling Field

Formation of The Material Handling Institute, a non-profit organization to serve as a medium for exchanging facts and information about industrial material handling and the activities of manufacturers in that field, has been effected, and Lawrence J. Kline of the Mercury Mfg. Co., Chicago, has been elected president. Walter S. McCann, who has had long experience in trade association work, is acting secretary-treasurer.

LAWRENCE J. KLINE

Directors are: S. K. Towson, the Elwell-Parker Electric Co., Cleveland; Lester M. Sears, the Towmotor Corp., Cleveland; Walter C. Steubing, Lift Trucks Inc., Cincinnati; M. W. Heinritz, Philco Corp. Storage Battery Division, Trenton, N. J.; H. A. Carter, Geneva Metal Wheel Co., Geneva, O.; and L. G. Backart, the Rapid Standard Co., Grand Rapids, Mich.

BRIEFS . . . .

Paragraph mentions of developments of interest and significance within the metalworking industry

American Casting Co., Birmingham, Ala., has changed its corporate name to **Jackson Industries Inc.** There is no change in the company's structure.

—o—

Associated Engineers Inc., Ft. Wayne, Ind., management engineering consultant, has purchased a downtown office building there as a part of the company's expansion program.

—o—

Gray Iron Founders' Society, Washington, has established two annual awards totaling $700 for engineering student papers of outstanding merit on designated subject gray iron research.

—o—

Aluminum Co. of America, Pittsburgh, will continue in 1945 its liberalized vacation plan for hourly-rated employes, put into effect a year ago.

—o—

Dresser Industries Inc., Cleveland, reports preliminary figures of it and its consolidated subsidiaries for the year ended Oct. 31, 1944 show net sales of $55 million and net profit of $1,656,000.

—o—

Robins Conveyors Inc., Passaic, N. J., announces that Elmer C. Salzman, its vice president in charge of sales, has arrived in Rio de Janeiro on company business.

—o—

Amercoat Division, American Pipe & Construction Co., Los Angeles, has issued a two-color folder entitled "Amercoat No. 3 Plastic Coating," including data about elimination of corrosion.

—o—

Alloy Steel Gear & Pinion Co., Chicago, has won for the fourth time the Army-Navy Production award and has received a third white star for its Army-Navy flag in recognition of outstanding production of materials essential to the war effort.

—o—

Resistance Welder Manufacturers' Association, Philadelphia, has published a free booklet standardizing the nomenclature, definitions, and quality of resistance welding equipment.

—o—

Jones & Laughlin Steel Corp., Pittsburgh, announced more than 2500 shell plant workers at its McKeesport Works, Port Vue, Pa., have received the Army-Navy "E" award.

—o—

Columbia Chemical Division, Pittsburgh Plate Glass Co., Pittsburgh, has acquired the plant and sales organization of the Pacific Alkali Co., Los Angeles.

—o—

The Crosley Corp., Cincinnati, has appointed the Graybar Electric Co. Inc., Providence, R. I., as distributor for Rhode Island.

—o—

Optimus Detergents Co. has been organized and is in operation at Matawan, N. J., manufacturing industrial detergents.

—o—

Pullman-Standard Car Mfg. Co., Chicago, reports that cost of doing business accounted for more than 98 cents of every sales dollar in 1944.

—o—

Westinghouse Electric & Mfg. Co.,

East Pittsburgh, Pa., has developed a new brake which in one-fifteenth second can stop a direct-current motor turning at 16,000 revolutions per minute.

—o—

Graham-Paige Motors Corp., Detroit, has a backlog of war orders under which scheduled production for the next six months exceeds the total volume for the entire year of 1944 when approximately $50 million in armaments were produced.

—o—

The DeVilbiss Co., Toledo, O., will conduct four one-week free classes for industrial finishers who regularly use its spray painting equipment. Sessions start Jan. 15, March 12, April 16, and June 18.

—o—

The Bullard Co., Bridgeport, Conn., has received a fifth Army-Navy production award.

—o—

Baldwin Locomotive Works, Eddystone, Pa., has developed a vertical hydraulic press that molds plastics and utilizes electronic heating of the plastic material.

—o—

United States Rubber Co., New York, has announced a new principle in rayon tire construction which strengthens synthetic rubber truck tires and assures tire production. Stronger but fewer plies are used in tires under the new method.

—o—

Bowser Inc., Ft. Wayne, Ind., has leased the two plants of Dexter Machine Products Inc. at Chelsea and Stockbridge, Mich., to expand its war production program. The new division will be known as the Dexter division, with R. F. Trimbach general manager.

—o—

Faraday Electric Corp., Chicago, has acquired the signal systems department of Holtzer-Cabot Electric Co., Boston. The latter will continue production of motor generators, fractional horsepower motors and precision equipment for the electrical industry.

—o—

Marinship Corp., Sausalito, Calif., has recevied a Navy contract for construction and delivery of four oilers.

—o—

Beryllium Corp. of Pennsylvania, Reading, Pa., has reopened its Chicago sales office with headquarters in the Engineering building, Chicago.

—o—

Chrysler Corp., Detroit, recently purchased 40 acres of land adjacent to its existing plant at San Leandro, Calif., for approximately $60,000 and probably will use it for postwar expansion.

—o—

Willys-Overland Motors Inc., Toledo, O., conducted a test demonstration of the more than a dozen new postwar industrial uses for the jeep.

—o—

Fisher Body Division, General Motors Corp., Detroit, reports a two-story addition will be made to its main plant of the Ternstedt Mfg. unit in Detroit to provide new medical, cafeteria, hospital and employment facilities. The new building will add 63,000 square feet to the plant.

—o—

Consolidated-Vultee Aircraft Corp., San Diego, is constructing there adjoining Lindberg Field runway a wind tunnel and aeronautical laboratory.

—o—

Florence Stove Co., Gardner, Mass., has acquired the Marshall Stove Co., Lewisburg, Tenn., in its planning for postwar in the cooking and heating fields.

—o—

Stewart-Warner Corp., Chicago, announces location of its sales, advertising and service department offices at the corporation's main plant at 1826 Diversey Parkway, Chicago.

—o—

The Hinde & Dauch Paper Co., Sandusky, O., will construct a building adjoining its Buffalo plant to permit expansion of manufacturing facilities.

—o—

Trackson Co., Milwaukee, has received a third Army-Navy award, a second white star for its "E" flag.

—o—

General Electric Co., Schenectady, N. Y., reports eight Alco-G. E. 1000 horsepower diesel-electric engines replacing 17 steam locomotives and an unprecedented volume of military passenger traffic since they went into service less than a year ago at the Staten Island, N. Y., yards of the Baltimore & Ohio railroad.

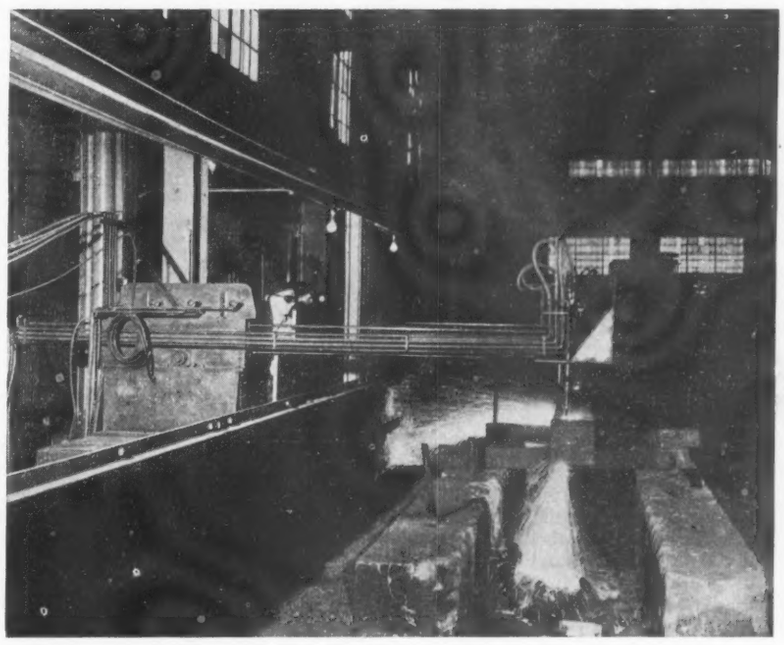
Plant To Boost Its Galvanized Sheet Production

U. S. Steel subsidiary to close old hot mills, releasing workers to man facilities for producing extra war needs

BECAUSE of urgent increased government demands for galvanized sheets, the Vandergrift, Pa., plant of Carnegie-Illinois Steel Corp. will undertake production of an additional 3000 tons of this product per month.

To utilize existing manpower to the fullest possible extent, the plant of this United States Steel Corp. subsidiary will shut down certain old hot mills and employes from these units will be available to man the galvanizing facilities. The transfer will necessitate the hiring of less than 100 additional employes.

It was pointed out by the company that continued high production levels on the old type hot sheet mills until recently were due to the fact that modern continuous sheet and strip facilities normally producers of this material, had been converted to plate production almost exclusively to satisfy unprecedented wartime demand for shipbuilding and other heavy gauge flat-rolled products.



"MADE TO MEASURE": Alloy steel blooms and billets cut to size are being shipped from A. M. Byers Co.'s plant at Ambridge, Pa., following installation of this new hot cropping machine, especially designed by Air Reduction Corp. The hot cropper, with twin water-cooled torches using the oxy-acetylene process, can cut to length all sizes up to 24 x 24 inches

THE BUSINESS TREND

Tempo of Industrial Activity Turns Upward

TEMPO of industrial activity has increased slightly in the last two weeks, as military developments spurred still greater production effort as reflected in a lessening of the labor turnover rate and fewer instances of absenteeism. In some localities the unusually severe winter weather forced a temporary increase in absenteeism, but this condition prevailed for only a brief period.

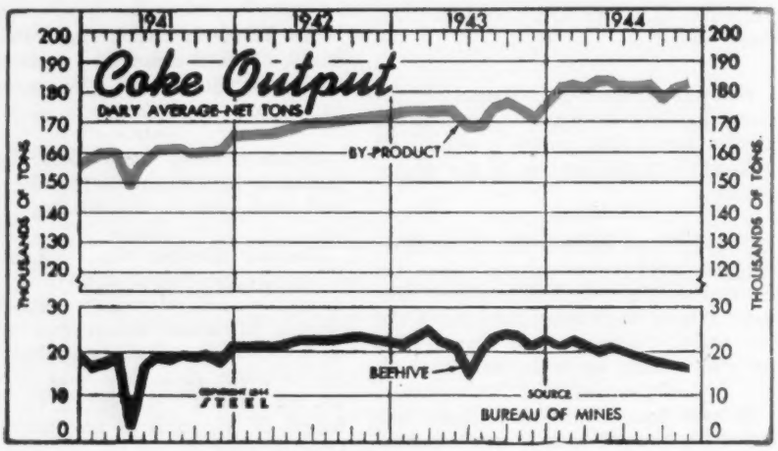
Overall production has regained all of the ground lost during the year-end holiday period, and on the basis of incoming orders and indicated swing-back of employment in less essential jobs to war work there is good prospect that total war output will record steady improvement over coming weeks. The abnormally low level of war contract cancellations is also a factor in permitting uninterrupted production.

During the latest period encouraging gains were recorded in steel ingot production, electric power consumption, engineering construction and revenue freight carloadings. Railroad freight loadings in the first quarter are expected to total 8,787,396 cars, an increase of 18,742 over the like 1944 period. Significant development in the electric power industry has been the termination of the declining trend of power consumption after reaching the 1944 low point during the week ended Oct. 21. Reopening of numerous ammunition and armament plants was the chief factor.

COKE—With the exception of scrap the steel industry is most concerned over the adequacy of coking coal supplies. Adverse weather has not only restricted mining operations, but also the shipment to consuming points and the unloading of the material upon arrival. Many steel interests' coke stocks are depleted and they are operating on a hand-to-mouth basis. Latest Bureau of Mines' figures show November output of by-product and beehive coke at 5,955,362 net tons. This represents a decrease of 206,391 tons below the October output and 195,562 tons above that recorded in November, 1943. On Nov. 20 last, 65 new Koppers-Becker ovens were placed in operation, adding 1344 tons to the daily coke producing capacity of the industry.

Stocks of by-product coke at producers' plants increased 157,560 tons during November and on Dec. 1 were equivalent to 6.6 days' production at the November rate.

LIVING COSTS—Bureau of Labor's cost of living index during November recovered the slight decline recorded in the preceding month to match the war time peak level recorded by the index of 126.5, with the period 1935 through 1939 representing 100. The low point reached by the index last year was 123.8 during February and March. The Bureau's index on wholesale commodity prices climbed to a wartime peak of 104.4 last November, with 1926 representing 100. The latest index figure compares with 102.9 in November, 1943.



Coke Output
Bureau of Mines
(Daily Average—Net Tons)

	By-Product		Beehive	
	1944	1943	1944	1943
January	182,226	174,044	21,933	21,440
February	184,384	175,099	22,248	23,987
March	183,123	175,051	21,529	24,369
April	185,259	175,857	20,457	22,948
May	184,071	174,400	20,783	21,200
June	181,891	168,900	20,472	14,000
July	181,506	170,100	19,531	20,400
August	181,718	176,600	18,572	23,100
September	179,234	178,090	17,305	23,637
October	181,772	175,492	16,994	23,495
November	182,274	171,594	16,238	20,421
December	.....	179,042	.....	22,935
Average	.....	174,465	.....	21,795

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	95.5	92.5	96.5	96.5
Electric Power Distributed (million kilowatt hours)	4,600†	4,226	4,538	4,568
Bituminous Coal Production (daily av.—1000 tons)	1,367	1,800	1,973	1,753
Petroleum Production (daily av.—1000 bbls.)	4,679	4,706	4,704	4,365
Construction Volume (ENR—unit $1,000,000)	$28.8	$23.2	$18.1	$21.6
Automobile and Truck Output (Ward's—number units)	19,735	20,005	20,340	18,090

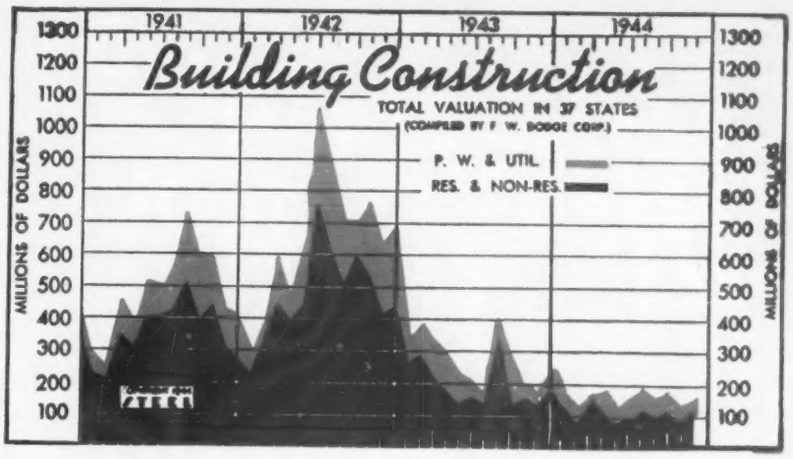
*Dates on request.

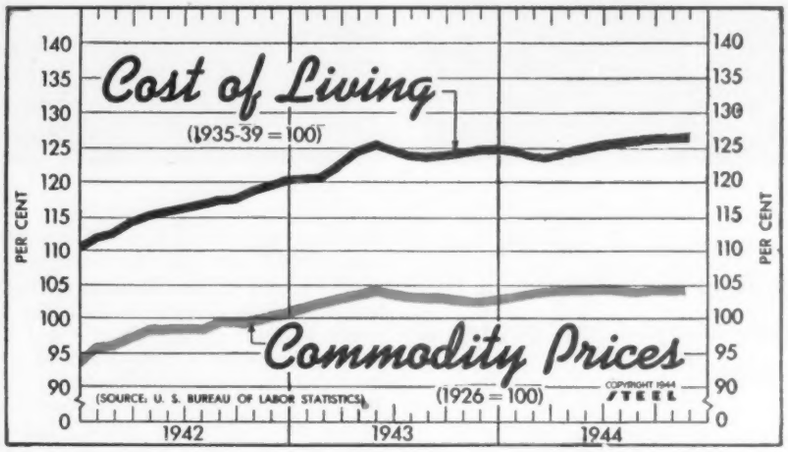
TRADE				
Freight Carloadings (unit—1000 cars)	700†	585	794	763
Business Failures (Dun & Bradstreet, number)	19	22	10	31
Money in Circulation (in millions of dollars)‡	$25,326	$25,335	$25,107	$20,436
Department Store Sales (change from like week a year ago)‡	+34%	+17%	+17%	+22%

†Preliminary. ‡Federal Reserve Board.

Construction Valuation In 37 States
(Unit—$1,000,000)

	Total	Public Works-Utilities 1944	Public Works-Utilities 1943	Residential-Non-Res. 1944	Residential-Non-Res. 1943
Jan.	159.2	50.3	85.8	108.9	264.3
Feb.	137.2	55.1	112.9	82.1	280.5
Mar.	176.4	61.3	123.0	115.1	216.7
April	179.3	72.0	127.7	107.3	175.6
May	144.2	55.8	95.8	88.4	138.6
June	163.9	70.7	73.3	93.1	156.8
July	190.5	80.5	50.0	110.0	133.7
Aug.	169.3	69.4	73.4	99.9	340.8
Sept.	175.7	64.1	175.1	111.6	125.0
Oct.	144.8	52.2	63.5	92.6	150.0
Nov.	164.9	48.0	59.0	116.9	125.4
Dec.	....	...	67.4	....	184.9
Total	....	...	1,106.9	....	2,106.4



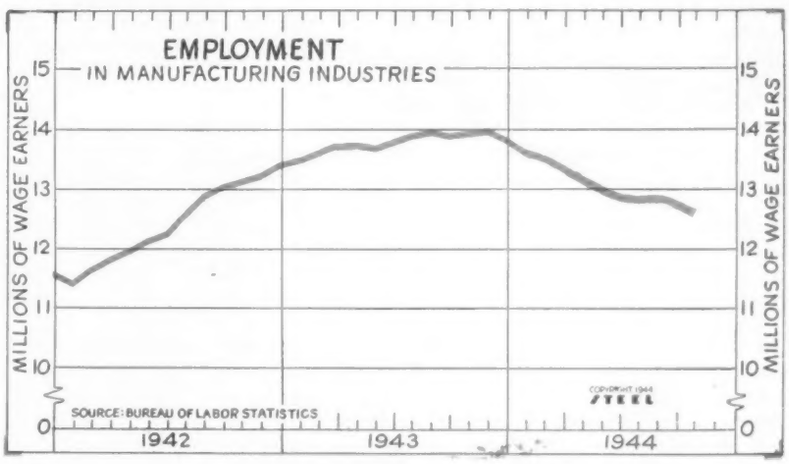


Wholesale Commodity Price—Cost of Living Indexes

	—Commodities— (1926=100) 1944	1943	1942	—Living Costs— (1935-39=100) 1944	1943	1942
Jan.	103.3	101.9	96.0	124.2	120.6	112.0
Feb.	103.6	102.5	96.7	123.8	120.9	112.9
Mar.	103.8	103.4	97.6	123.8	122.8	114.3
Apr.	103.9	103.7	98.7	124.6	124.1	115.1
May	104.0	104.1	98.8	125.1	125.1	116.0
June	104.3	103.8	98.6	125.4	124.8	116.4
July	104.1	103.2	98.7	126.1	123.8	117.0
Aug.	103.9	103.1	99.2	126.4	123.2	117.5
Sept.	104.0	103.1	99.6	126.5	123.9	117.8
Oct.	104.1	103.0	100.0	126.4	124.4	119.0
Nov.	104.4	102.9	100.3	126.5	124.1	119.8
Dec.	....	103.2	101.0	....	124.4	120.4
Ave.	....	103.2	98.8	....	123.5	116.5

Factory Employment
(000)

	1944	1943	1942
Jan.	13,669	13,503	11,456
Feb.	13,594	13,633	11,654
March	13,406	13,727	11,821
April	13,173	13,735	11,988
May	13,020	13,700	12,127
June	12,985	13,827	12,282
July	12,924	13,911	12,564
Aug.	12,942	13,990	12,869
Sept.	12,802	13,935	13,079
Oct.	12,660	13,965	13,166
Nov.	.....	14,007	13,267
Dec.	.....	13,878	13,474



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$11,380	$9,838	$12,829	$10,180
Federal Gross Debt (billions)	$232.4	$231.7	$226.4	$170.3
Bond Volume, NYSE (millions)	$79.7	$45.5	$67.7	$72.4
Stocks Sales, NYSE (thousands)	7,873	6,722	8,071	4,429
Loans and Investments (millions)†	$59.7	$59.9	$55.1	$49.7
United States Government Obligations Held (millions)†	$43,803	$43,786	$42,874	$36,109

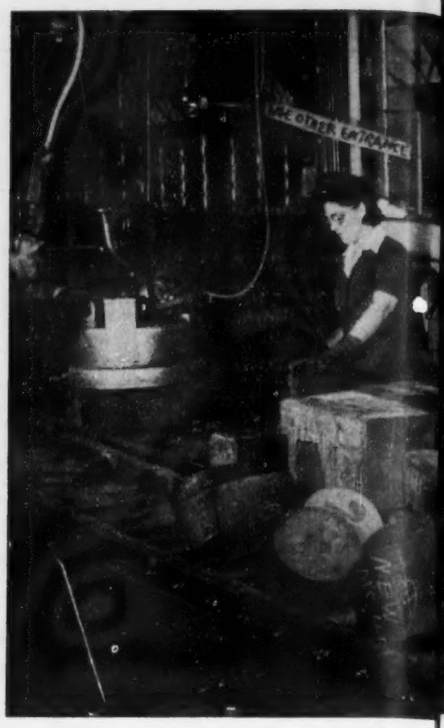
†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
All Commodities‡	104.7	104.6	104.2	103.0
Industrial Raw Materials‡	115.7	115.4	114.4	112.3
Manufactured Products‡	101.3	101.3	101.3	100.3

‡Bureau of Labor's Index, 1926 = 100.

Metallurgical Control of Forging



Important factors in controlling quality of aircraft forgings are discussed by a prominent metallurgist in this SAE report. Warns chemical analysis as guide in specifying should not be minimized

By A. J. PEPIN

Chief Metallurgist
Eastern Division
Wyman-Gordon Co.
Worcester, Mass.

AIRCRAFT design engineers are obligated by an inherent responsibility generally not required of designers of other types of equipment. Failure of a critical aircraft part in service is likely to endanger human life. Yet because of the premium on weight, safety factors must be held to the safest minimum. For these reasons aircraft designers are primarily interested in high quality materials such as alloy steel aircraft forgings and the scientific control of their processing.

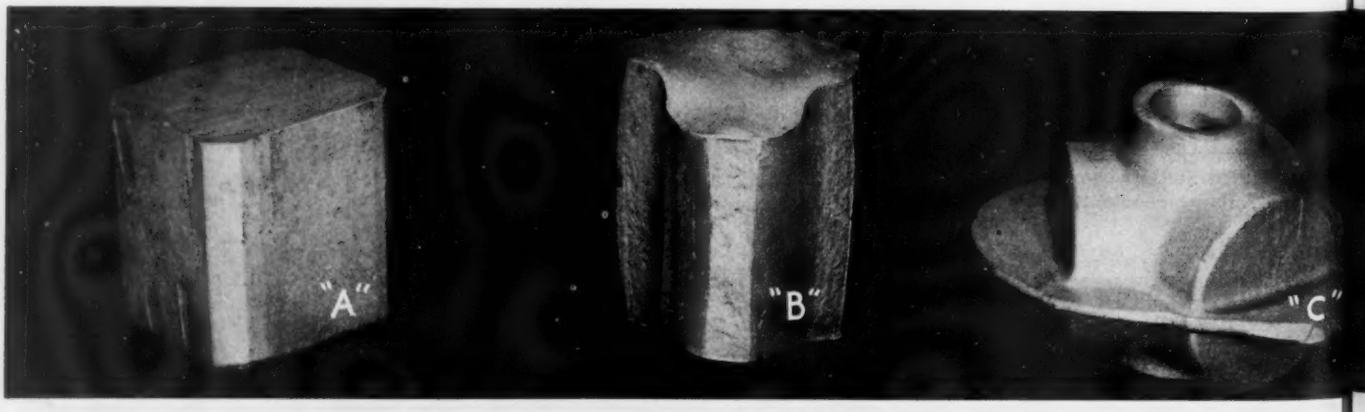
"Aircraft quality" is emphasized because forgings made to these standards represent the highest quality parts that the forging industry is capable of producing. The inherent responsibility of the aircraft designer is shared by the forger as well as the supplier of the forger's raw material, the aircraft quality steel producer.

"Aircraft quality" steel is a superior product sold at a premium above regular forging quality steel. It must be forged and subsequently heat treated under processing controls, which will insure parts as close to perfection as it is possible to produce.

As forging and heat treating are essentially metallurgical processes, metallurgical control is a most important factor in securing high quality in parts manufactured by this method. It is the object here to describe, briefly, the metallurgical controls in use at the Wyman-Gordon Co. The Eastern Division of this company at Worcester, Mass., furnished large quantities of aircraft engine forgings during World War I and had continued to supply this field ever since. At the present time, as for the last ten years, practically 100 per cent of the output of this plant is for the aircraft industry.

Metallurgical control in the production of forgings fulfills two functions: First, to maintain quality on existing parts; and second, to assure it in new designs which require the development of new forging techniques. It is axiomatic that the first prerequisite for proper metallurgical control is a well equipped laboratory manned by a capable well organized staff. Table on page 88 illustrates the metallurgical organization chart with the various operating departments.

In addition to the ordinary metallurgical tests and controls, there are several new functions which are probably not very well known. Two of these, which we feel are of particular importance, are the billet magnaflux test (2) which is used to detect flaking in saw and



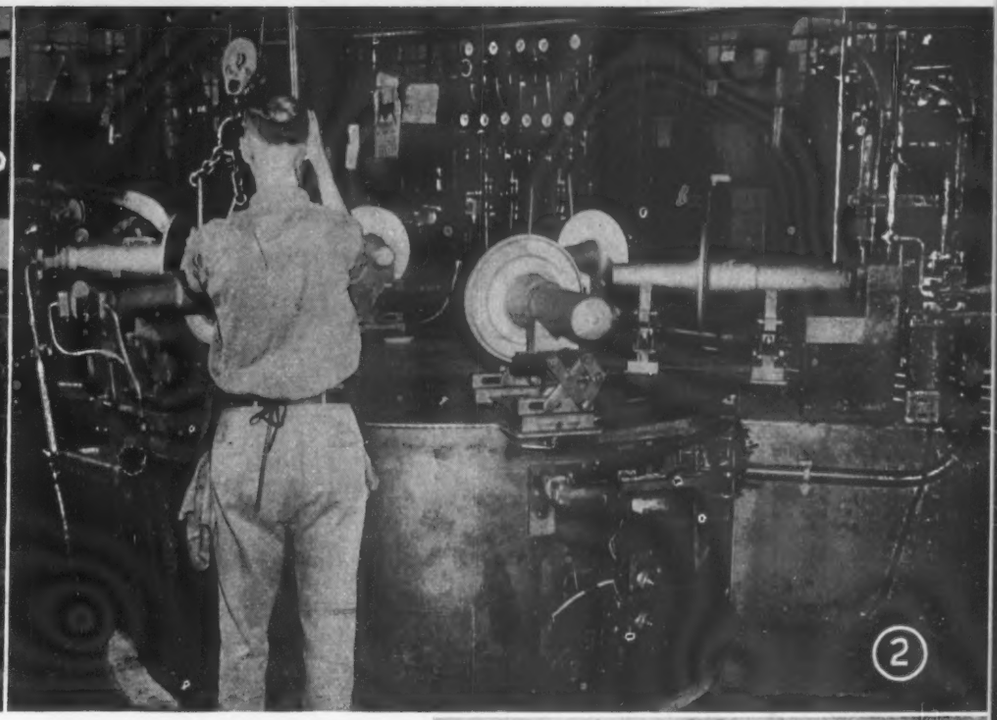
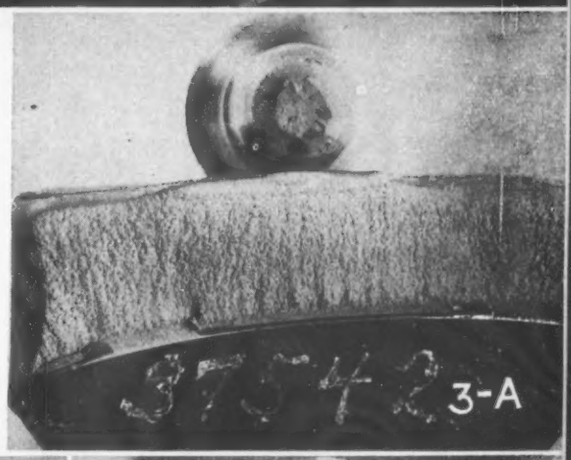
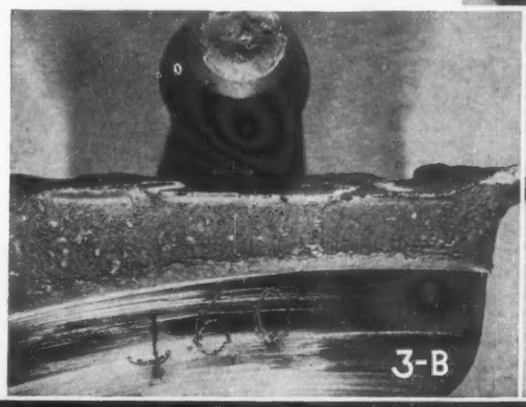


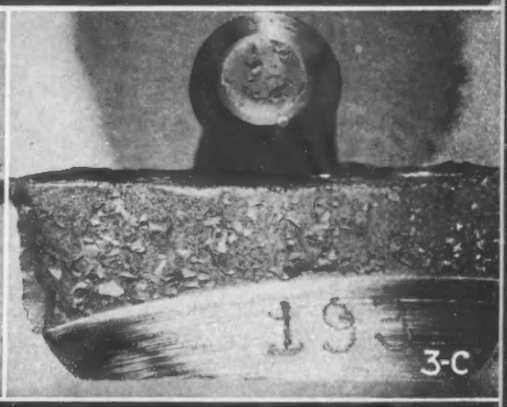
Fig. 1—Production line Magnafluxing of saw-cut forging multiples to detect flaking in the steel

Fig. 2—This setup combines an automatic fracture test, an oxyacetylene flame cut-off, hardening and drawing

Fig. 3—Various types of fractures: "A" — Acceptable fracture, no facets; "B"—Acceptable fracture, few scattered slight facets; "C"—Unacceptable coarse fracture





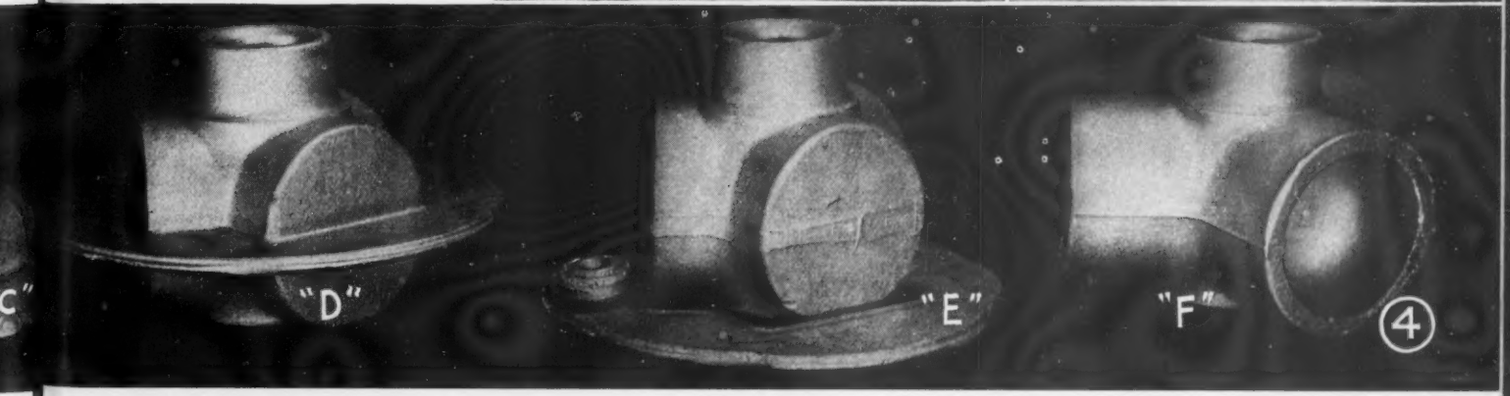


torch cut billet stock by means of magnetic particle testing, and the fracture test (5) which is used as a check of forging practice. The use of these checks on a production basis was developed by our company and they have now been in use for some years.

The attempt has been made to carry the metallurgical services direct to the point in production where they are most needed. Thus, a considerable part of the organization actually works in the shop proper. The primary functions of the forge shop metallurgist, heat treat metallurgist and instrument engineer are tied in with shop problems, and the highest percentage of workmen under their jurisdiction are employed in the plant rather than the laboratory. Needless to say, for this type control to work effi-

(*Please turn to Page* 88)

Fig. 4—Forging sequence on typical semi-pierced hub: "A"—Forging multiple; "B"—First breakdown; "C"—Second breakdown; "D"—Final hammer operation; "E"—Trim flash; "F"—Extruded finished hub



SHAPING

WITH MORE than 16,000 hard steel dies in use today at Ford's Willow Run plant for stamping out myriad parts for the B-24 bomber, and with millions of manhours saved thus far in the production of Liberators by use of such dies, Ford engineers have been able to prove to the aircraft industry that aluminum can be shaped successfully and on a mass production basis with steel dies.

Fearing that soft dies—commonly in use as established aircraft manufacturing practice at the time Ford Motor Co. began its bomber program—would require too many manhours for maintenance under a heavy production schedule, Ford engineers at Willow Run boldly substituted steel dies similar to those used in automobile manufacture.

By utilizing the technique acquired in fabricating steel fenders and bodies for automobiles, by designing and constructing a new type of press and by the use of steel dies on an unprecedented scale,

Fig. 1—Part of Willow Run's battery of heavy hydraulic presses of 1000-ton pressure capacity used to stamp out aluminum parts for the Ford B-24 Liberator. Hard steel dies are used throughout, following technique learned in the fabrication of automotive bodies

Fig. 2—Blanking out a section of the B-24's bomber's outer wing top skin, a stamping measuring 155 inches long, 32 inches wide. Press is rated 275-ton. Bed is 208 inches long. Blanking as well as piercing of rivet holes is done at a single stroke

ALUMINUM

With Steel Dies

Ford defies conventional practices in making bomber parts by adapting technique acquired in fabricating steel fenders and body parts for automobiles. Stack drilling of rivet holes replaced by use of piercing dies

Ford has been able to cut through bottlenecks and achieve bomber-an-hour production at Willow Run.

Faith in hard steel dies was founded on manufacturing experience reaching back nearly four decades, during which period automobile mass production had come into being. Ford engineers figured that by adapting steel dies to fabrication of aluminum alloy materials, larger sections of work could be handled, thus reducing press setups and assembly labor. Thousands of bomber parts could be made to exact shape and contour without frequent reworking and rebuilding of the dies.

After the decision was made to use steel dies at Willow Run, their manufacture involved a program equivalent to tooling for four car model changes all at once. More than 16,000 dies were needed, and every available shop in the Detroit area was pressed into service, along with the Ford Rouge plant's tool and die shop.

One reason for the doubts of experienced aircraft men was that many bomber parts had to be drawn and formed, followed by embossing, trimming and piercing operations; also the fact that sheets of light aluminum stretched about one-half as much as steel.

Some of the B-24's stampings were comparatively small, while others approximated the size of automobile body panels. Draw die for the bombardier's enclosure, for example, weighed 15 tons; stampings produced by it measured 56 by 70 inches, by 10 inches deep.

Between 6000 and 7000 different parts, such as wing bulkheads, spar webbings, beltframes, outer shells for doors, cowling flaps, vents and reinforcements, had to be produced by these dies.

Chief objection of Ford to the soft dies was the inevitable loss of precision in a high production run. The soft metal punches were subjected to a tremendous pressure in hydraulic presses, even up to 1000 tons. The first few pieces formed were exactly to the die, but as the run continued, the punch disfigured the face of the die and the parts then received only a partial forming. Difference was visible even to naked eye.

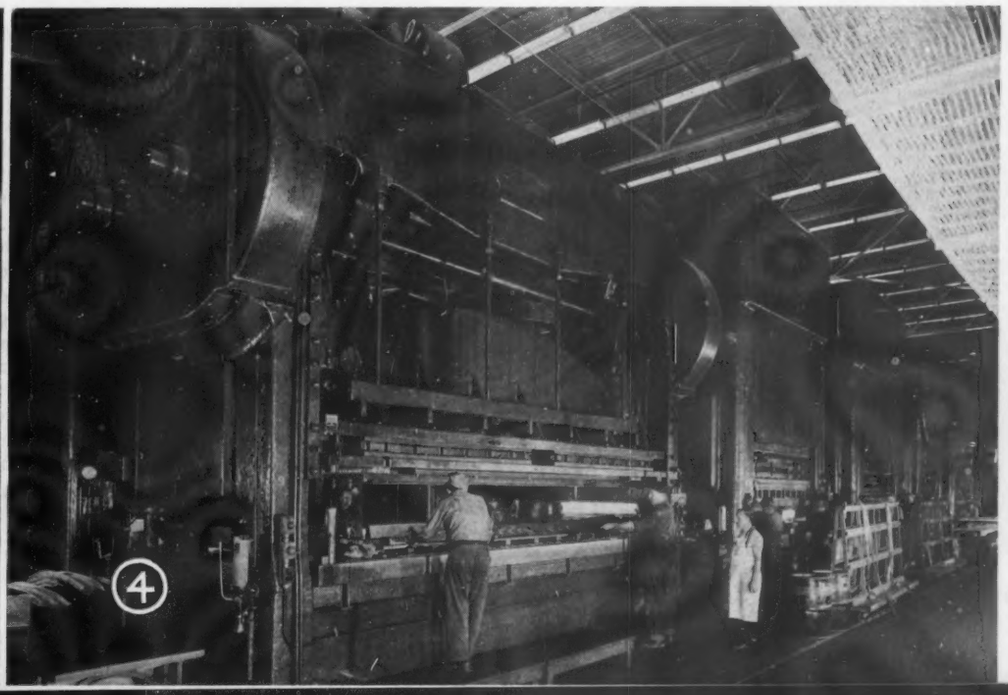
In blanking operations of heavy stock, after a few hundred pieces had been run, the soft die would become dull. While the edges of the die could be peened and then trimmed by lowering the punch, this entailed greater maintenance cost of the tool.

The unconvinced advocates of the soft dies pointed out what in their opinion was a fatal defect of the steel dies. When a part was formed in the hydraulic press with the soft dies, the pressure was applied evenly over the entire surface of the aluminum stock by the rubber pad. This caused the metal to "flow" into the desired shape without shock to the molecular structure. In the use of hard dies, they contended, the metal would be "forced" into shape, setting up

(*Please turn to Page* 116)

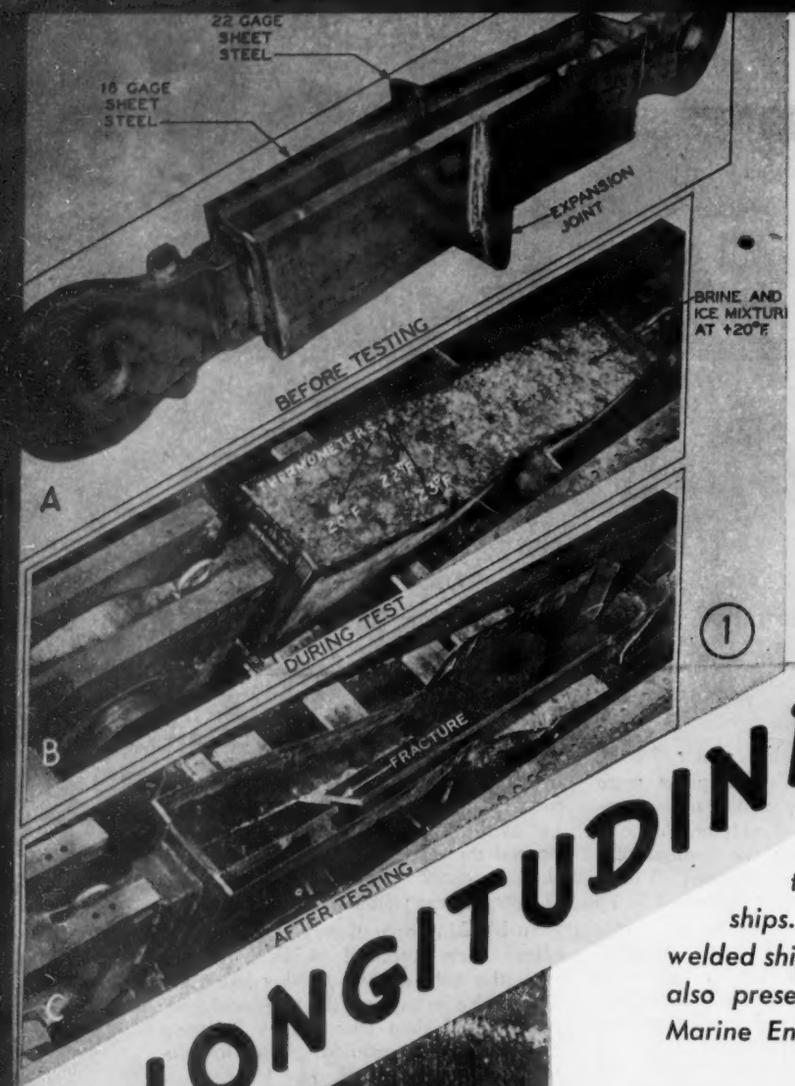
Fig. 3—One of the deepest "draws" made on aluminum material—a 9-inch deep panel for the di-icer tanks of a B-24 Liberator. The 1000-ton hydraulic press has a bed 120 x 80 inches

Fig. 4—Typical of the equipment in the huge press shop at Ford's Willow Run plant is this row of stamping presses. Unit in foreground is 275-ton capacity press being used to stamp out a spar which goes in the fin of the empennage of the Ford-built Liberator. This press was moved from the Rouge plant to Willow Run along with other equipment when bomber job was started



Tensile Properties of LONGITUDINALLY WELDED P

By LEON C. BIBBER
Welding Engineer
Carnegie-Illinois Steel Corp.
Pittsburgh



Here are presented details of tests on full size specimens designed to simulate constructions found in welded steel ships in an effort to learn more about factors involved in cracking and breaking of welded ships. Some full size specimens were actually cut from welded ships to further extend the scope of these investigations, also presented before the Society of Naval Architects and Marine Engineers

FAILURE of a number of welded ships during recent years has brought into sharp focus a great many questions pertaining to the performance of steel as welded in such large structures. More information was needed on the performances of steel in large heavy structures loaded in tension. So a series of tensile tests were conducted on certain large and unusual specimens simulating constructions existing in actual ships.

Most ship fractures have been square, sharp breaks with no apparent elongation, suggesting to some the unwarranted conclusion that the steel was brittle. It was hoped that test specimens, large and thick enough, could be made which would fail with square fractures with little or no elongation; in other words, we wanted to duplicate the failures in the ships. This hope was not realized as will be seen later.

The general object of the study was to observe the mode and extent of flow in ordinary commercial heavy mild steel plates of known tensile properties in the form of specially shaped, welded and variously conditioned tensile specimens. Secondary objects were:

(a) To determine the strength, elongation and manner of deformation and failure of

1. Specimens simulating the corner type of gunwale construction as it exists on certain Great Lakes ore carriers.
2. Specimens simulating the T-type of gunwale construction as it exists on certain oil tankers.
3. Short, wide, flat plate specimens designed to restrain the lateral reduction of the material and simulate conditions existing at points of restraint in the ship structure.
4. Long, wide, flat plate specimens designed to simulate the stress conditions in tension existing in flat structure of considerable length.

(b) To determine the effect upon behavior under tension of

1. Stress relief annealing applied to virgin base metal and welded specimens.
2. Transverse locked-up stress.
3. The welding process used. (Unionmelt welding, manual arc welding.)
4. Temperature of testing. (Plus 70 degrees Fahr. and plus 20 degrees Fahr.)

(c) To determine the tensile properties throughout the cross section of the specimens by means of small-specimen tensile testing.

Apparatus: The specimens were tested in the large 4,000,000-pound hydraulic eye-bar testing machine of the

Fig. 1—Method of making lowered temperature tests; A, before testing; B, during test and C after testing. Specimen 203E shown

Fig. 2—Typical appearance of incipient surface cracks in face of submerged arc weld

PLATE

American Bridge Co., Ambridge, Pa. This machine, shown in Fig. 3, is capable of testing eye bars 40 feet long. The great length of the machine girders can be seen extending into the background of the picture. The load is transmitted from the moving head shown in the immediate foreground to the specimen by means of pin connections. On the larger specimens pins 16 inches in diameter were used. The movement of the head of the machine is indicated by means of a pointer indicator attached to the top tie rod as shown.

All tensile test data on small standard round specimens were taken by automatic load-extension recording devices.

Procedure: Special procedures are described in discussing individual tests. Following were common to large specimens.

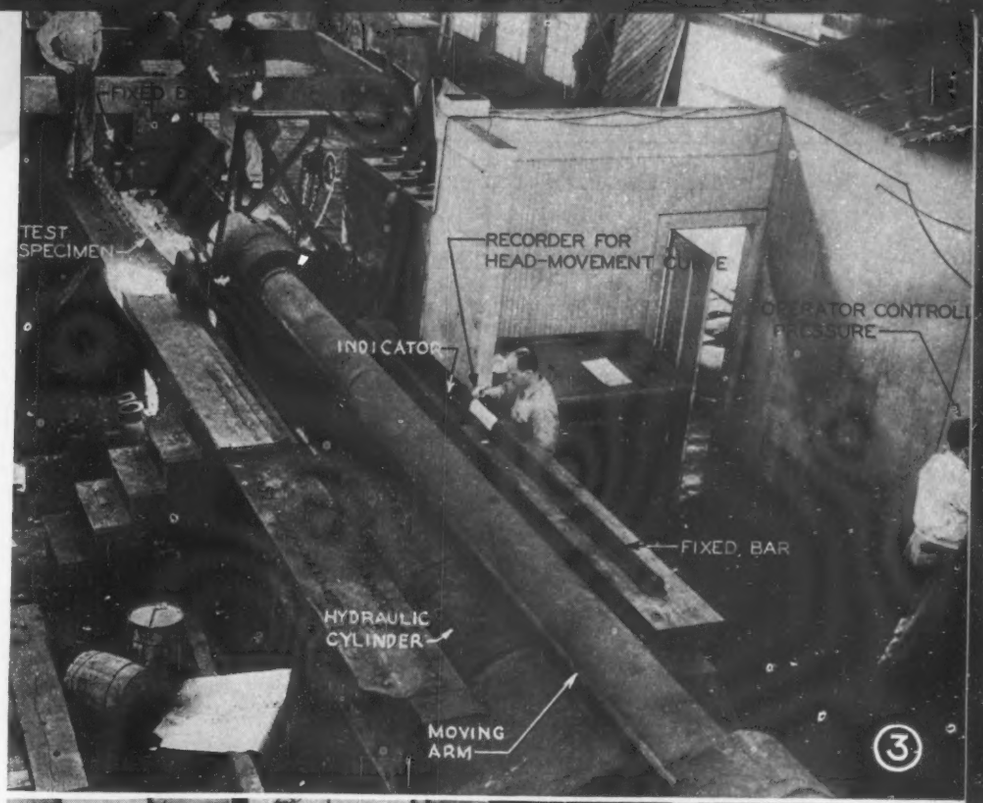
Gage points were center-punched into the specimens at various locations along the length, and many length, width and thickness readings were taken before the specimen was tested.

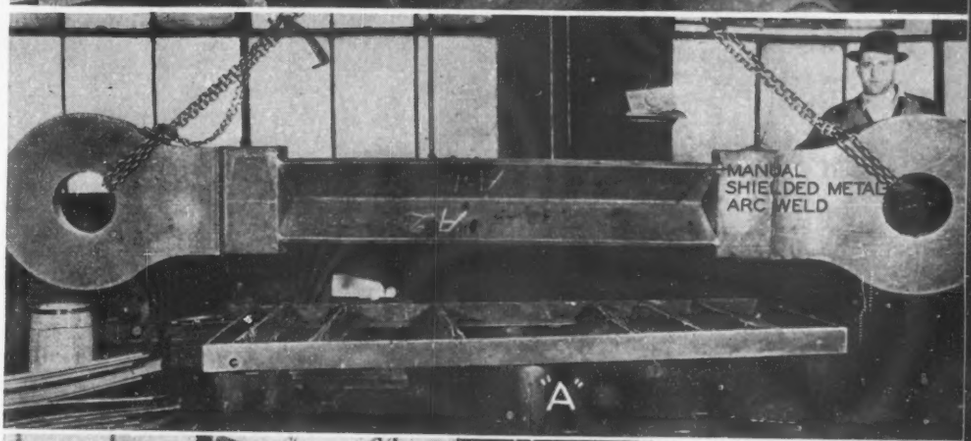
The Pneumercator gages for indicating pressure were calibrated with a dead weight gage tester immediately before or after the completion of each set of tests. All data in the tables of this report show loads and stresses after gage corrections have been made.

A record of the total movement of the head of the testing machine was obtained throughout each test by marking the movements of the pointer for each significant load on a sheet of paper as can be seen in Fig. 3. These data enable what we have called a "load-head-movement" curve to be plotted. This resembles a conventional load-extension curve except that it contains a certain amount of strain error in that the head movement includes some slight movement of the end links and possibly some crushing of the pin connections.

Yield-point load could be detected readily by movement of pointer. However, cracking of mill scale from specimen also proved to be an interesting indicator. Brilliant photographic floodlights detected smallest particles of falling mill scale.

As soon as practicable after failure of





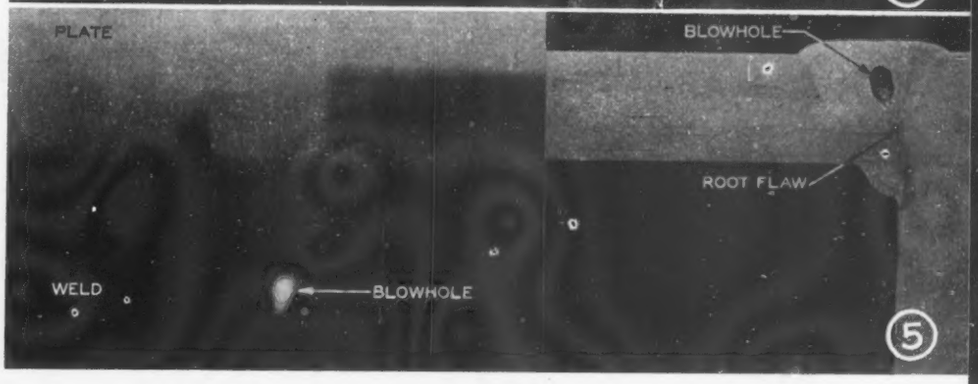


Fig. 3—View of general testing arrangements

Fig. 4—Inside (A) and outside views (B) of angle test specimen, full size construction

Fig. 5—X-ray (left) and macrograph (right) through blowhole in submerged arc weld

TABLE I—LIST OF ANGLE TYPE SPECIMENS

Reduced section length, in.	Type of Specimen	Welding conditions: Process	Welding conditions: Restraint during welding	Welding conditions: Post heat treatment	Temperature of test, deg. F.	Mark (1 each required)
72	Welded long, corner joint	Unionmelt one side. Manual metal-arc one side	None	None*	62	203A
				Normalized†	65	203B
				None	55	203C
				None	65	203D
				None	20	203E
				None	20	203B1
46			That in ship			

*Cold straightened after welding.

†Straightened and normalized (1610 degrees F. 1½ hours cooled in air).

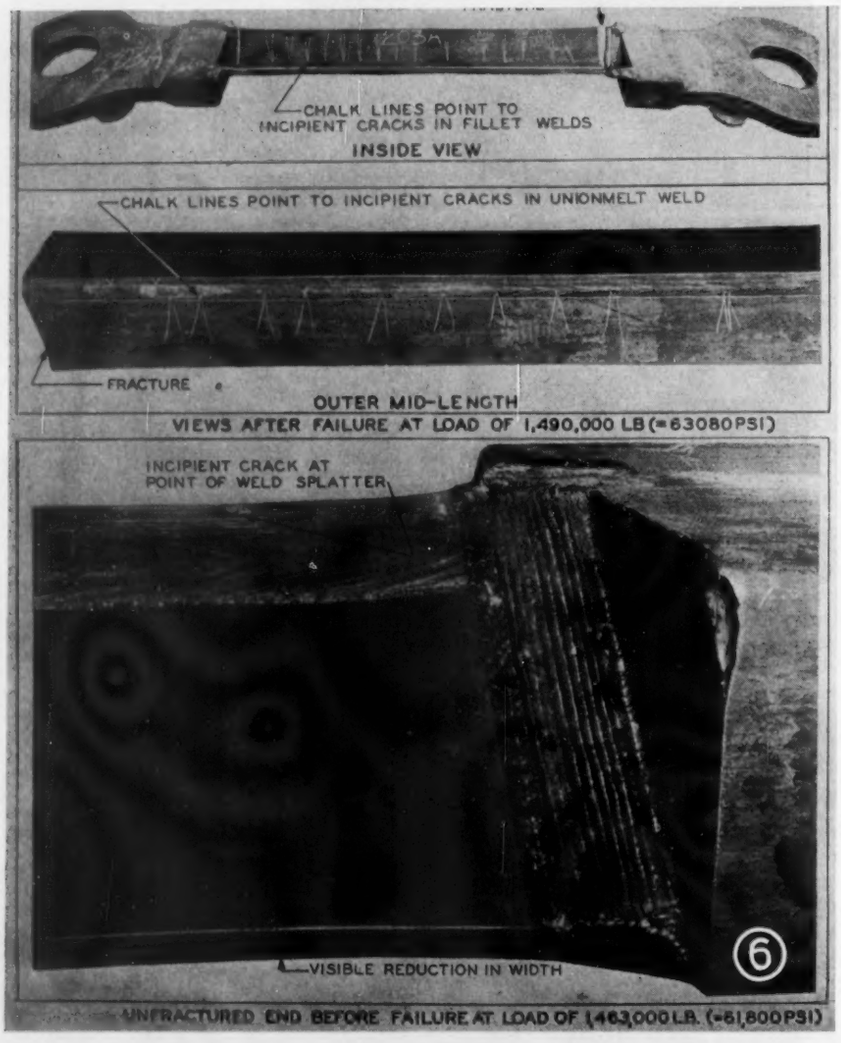
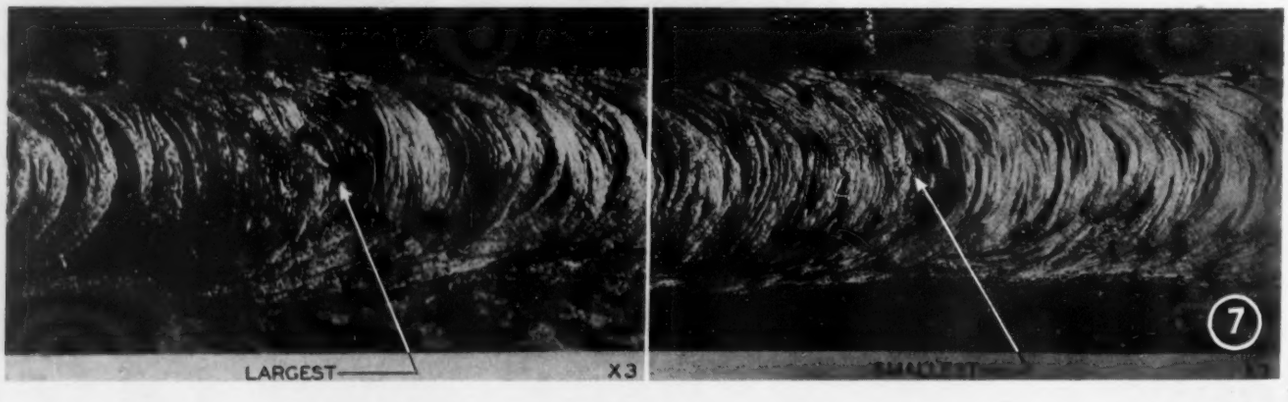

CHALK LINES POINT TO INCIPIENT CRACKS IN FILLET WELDS
INSIDE VIEW
CHALK LINES POINT TO INCIPIENT CRACKS IN UNIONMELT WELD
FRACTURE
OUTER MID-LENGTH
VIEWS AFTER FAILURE AT LOAD OF 1,490,000 LB (=63080PSI)
INCIPIENT CRACK AT POINT OF WELD SPLATTER
VISIBLE REDUCTION IN WIDTH
UNFRACTURED END BEFORE FAILURE AT LOAD OF 1463000 LB. (=61,800PSI)
6

Fig. 6—Details of failure of specimen 203E. (Straightened after welding, not heat treated)

Fig. 7—Typical appearance of incipient cracks in inside fillet welds



the specimens, the clean fractures were photographed.

The lengths between gage points and fractures were measured so that the actual elongation measurements after fracture could be obtained. Final measurements of width and thickness were made at the fracture and also at the same points at which the original readings had been taken. The fracture measurements were used in the determination of the reduction of area at the fracture. The average reduction of area over the entire reduced section (including the fracture) was calculated from all thickness and width readings.

Several hours were necessary to bring the specimen down to the predetermined low temperature. It should be noted that in one case we were able to attain a temperature of plus 6 degrees Fahr. with salt and ice in the metal container. The temperatures were measured by means of mercury and dial thermometers.

"Yield point", when used in connection with small coupons which have been designed to give practically uniform stress over the entire cross-sectional area, may be considered as representative of that property of the material. On the other hand, when the words "yield point" are used in connection with the large specimens which contain weld metal and heat-affected zones of different properties from that of the virgin base metal and are in some cases designed deliberately to give nonuniform stress distribution, the term means that average stress (load original section area) at which a marked deformation of the large specimen occurred and signifies merely a nominal yield point.

The same reasoning applies to the strength of the material. The total load at which the large specimens failed divided by the original cross-sectional area gives an average value which is really only a nominal ultimate tensile strength, though after deformation the stress is probably nearly uniform.

In the case of elongation, the values obtained over many years from the small

specimens have been considered representative of the property of ductility. In the case of the large specimens, the elongations obtained are merely the elongation of the unusual-shaped large specimens containing a nonuniform stress distribution.

Testing the Corner Type of Gunwale Construction: A general view of the original specimens is shown in Fig. 4. The specimen itself was made of 1¼-inch thick plate having the corner construction used on certain Great Lakes ore carriers. The angle-shaped specimen simulating the junction of the deck stringer and sheer strake is attached directly to 8-inch blocks in turn joined to large eye-shaped end connections. The specimen is so located on the blocks that the center of gravity of the specimen is coincident with the centerline of the eyes so that no eccentricity of loading is introduced. No machining of this assembly for a reduced parallel section was possible without introducing eccentricity.

It was thought that with large well-faired complete-penetration welds connecting the 1¼-inch thick plate to the 8-inch end blocks the full strength of the specimen could be developed. It was found, however, that the concentrations of stress at the end welds were so great that failure occurred in the base metal at the toe of the welds. In Fig. 6 can be seen the effect of the restraint exercised by the large end welds on the reduction in width and thickness. Accordingly it was necessary to provide transition pieces which would enable the change from the 1¼-inch thick plate to the 8-inch block to be made in two steps to lessen the stress concentrations. This was accomplished through the agency of 2-inch thick angle-shaped sections seen in the lower view in Fig. 1.

The foregoing experience indicates the undesirability of connecting plates to thick sections even by the use of well-faired and complete-penetration welds.

The list of specimens tested is shown in Table I. This table also includes the specimen cut from an actual ore carrier.

Material: In Table II are given details of the analytical data and tensile tests of the steel used for this series of experiments. Both the standard flat plate specimens required by the American Bureau of Shipping and standard ASTM 0.505-inch round specimens were used in determining the tensile properties of the material. Plates from which specimens 203D and 203E were made had ultimate tensile strengths slightly below the 58,000 pounds per square inch value of the American Bureau of Shipping; all other material complied with the requirements of the Bureau. The chemical analyses given are quite usual for this class of material.

In the lower part of Table II will be seen the Charpy notched-bar impact values for the different plates, made with the notch parallel to the plate surface. Note that these values at plus 20 degrees Fahr. are low and at minus 20 degrees are lower. This is characteristic of thick mild steel plate. The notch-bar test is not a specification requirement for ship steel. No structural steel is sold on that basis.

Accurate proportional limit tests were made on the 0.505-inch specimens and it will be seen that the proportional limit when *properly* made approximates the yield-point fairly closely in this steel. Proportional limit tests should not be made on flat bar specimens because of the danger of eccentric loading and bending influencing the result.

Fabrication of Specimens: The design of the welded joint is exactly that used in the construction of certain Great Lakes ore carriers. Details of the fabrication before welding are given in Table III. All edges were machined.

The details of the welding shown in Table III were also practically the same as those used on the ship, except that the interior manual fillets were made downhand on the specimen whereas they were made overhead on the ship.

The treatment after welding of the individual specimens is also shown in Table III. The first specimen made was

TABLE II—PROPERTIES OF TYPICAL PLATE MATERIAL USED

Analysis	Ladle	Check
Carbon	0.24	0.26
Manganese	0.41	0.53
Phosphorus	0.021	0.023
Sulphur	0.030	0.034
Silicon	....	0.028
Copper	....	0.01
Nickel	....	0.03
Chromium	....	0.02
Molybdenum	....	0.00

Tensile data	Individual specimen results	
Type of specimen	Standard 0.505 in. diameter	Standard plate
Yield point, psi	30,950	
	30,950	35,300
	32,450	
Ultimate strength, psi	66,900	
	66,650	62,730
	66,650	
Elongation in 2", %	32.0	
	32.5	
	32.5	
Elongation in 8", %	....	
	....	26.5
	....	
Proportional limit, psi	30,333	
Reduction in area, %	54.7	
	53.3	48.1
Fracture	53.3	
	½ cup	
	½ cup	
Used for specimen marked	½ cup	
	203A, 203B and sheer strake of 203C	

Charpy impact (keyhole-notch parallel in plate surface)

Temperature of test, deg. F.	+70	+20	—20
Individual values	20.5	5.0	1.0
	19.0	3.5	1.0
	....	2.0	1.5
Average value	19.8	3.5	1.2

TABLE III—DETAILS OF FABRICATION AND WELDING

Specimen mark / Details of fabrication before welding		Details of Angle Test Specimens 203A-203B-203C Flame cut, flattened, and machined			203D-203E Flame cut, flattened machined, and reflattened	
		Details of Making Longitudinal Welds				
Mark	Process	Bead No. (see Fig. 3)	Electrode data: Brand	Size, in.	Arc volts	Current, amps
203A, 203B, 203C	Manual shielded metal-arc	1	Fleetweld 5	5/32	30	210
		2	Fleetweld 5	5/32	30	210
		3	Wilson 98	1/8	26	120
		4	Fleetweld 5	1/4	32	300
	Smothered arc	5	Oxweld 36	5/32	37	1400*
203D, 203E	Manual shielded metal-arc	1	Fleetweld 5	5/32	30	210
		2	Fleetweld 5	5/32	30	210
		3	Fleetweld 5	1/8	26	120
		4	Fleetweld 9	1/4	32	300
	Smothered arc	5	Oxweld 36	5/32	37	1400†

Treatment after welding longitudinal joint	203A Cold straightened	203B Cold straightened and normalized*	203C None	203D None	203E None
Type of end connection	1 in. x 2 in. fillets direct to eye-blocks Ends not ground	1 in. x 2 in. fillets direct to eye-blocks Ends ground smooth	5/8-in. x 1 in. fillets direct to eye-blocks Ends not ground	Faired welds to special 12 in. long 2 in. x 2 in. x 10 in. angle ends to minimize stress concentrations	

*1610 deg. F. 1½ hours air cooled.

†Speed = 6 inches per minute. Grind of melt = 20-200.

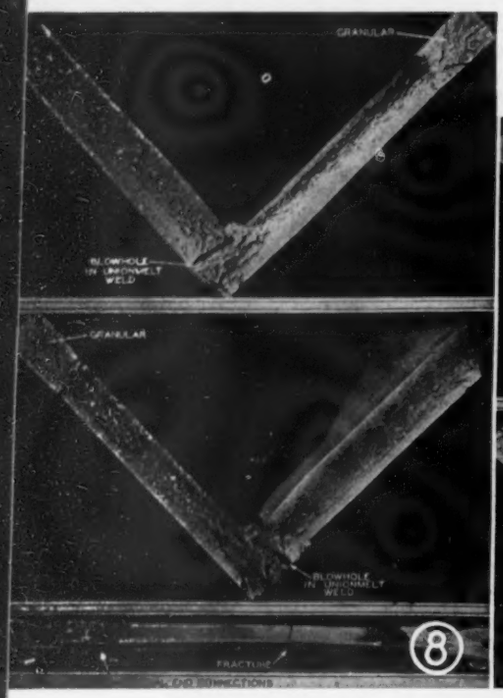


Fig. 8—Appearance and location of fracture in specimen 203D. Test made at 65 degrees Fahr. No heat treatment or straightening

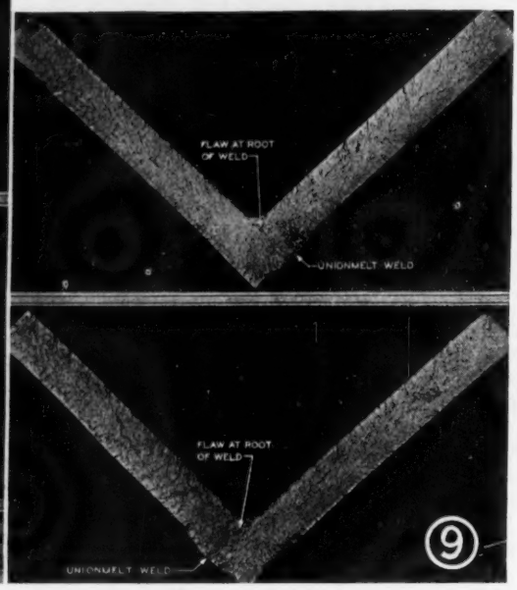


Fig. 9—Appearance and location of fracture in specimen 203E. Test was made at temperature of 20 degrees Fahr. Specimen was neither heat treated nor straightened

203C. This bowed more than 5/16-inch in 72 inches, due to the welding on the corner. This indicates the shrinkage stresses tending to bow the plating in the ship, but prevented from doing so by the restraint of the large surrounding structure.

As a result of this experience, the next specimen (203B) was cold straightened and then normalized to remove the effects of the cold working. This treatment also removed all heat effects of the welding. Of course normalizing cannot be applied to a ship, but it was desired to see just what effect this treatment would have. Specimen 203A was cold straightened without subsequent heat treatment. The remaining specimens were tested as welded.

All were X-rayed before testing. A typical radiograph is shown in Fig. 5. Isolated blowholes occurred in the specimen as can also be seen in Fig. 8. These blowholes also existed in the ships at intervals of every foot or so throughout the entire length of the ship. It is believed that these holes are the result of the gas entrapped in the incompletely penetrated root of the weld and are due to that design of joint.

The chemical analyses (in per cent) of the one plate, the wire and the resulting weld were as follows:

Element	Plate	Wire	Weld
Carbon	0.26	0.18	0.12
Manganese	0.53	1.88	0.57
Phosphorus	0.023	0.023	0.028
Sulphur	0.034	0.033	0.038
Silicon	0.028	0.036	0.32
Copper	0.01	0.11	0.08
Nickel	0.03	0.03	0.04
Chromium	0.02	0.00	0.02
Molybdenum	0.00	0.01	0.00
Vanadium	0.00	0.00	0.01
Titanium	...	...	...

The similarity except for carbon and silicon of the weld metal and the base metal is noteworthy.

The construction of the flanged type expansion joints is shown in Fig. 1. After the testing was completed, the simplest way to remove the tank was to pull it apart as illustrated in the lower view.

Results: The results of the tests are given in Table IV. Each specimen will be discussed in detail.

The term longitudinal efficiency used herein may be defined as follows: Longitudinal efficiency is the ratio of the longitudinal strength of the large welded or unwelded specimens to the strength of small standard plate coupons used in the normal testing of materials.

Specimen 203C: This was the first one tested. Cracking of the scale on the smothered arc weld was noted at a fairly low stress. The yield point, as determined by the shimmering of the flaking mill scale under the lights, was slightly lower than that of the coupon.

Due to the failure at the toes of the end fillets where nonuniform stress existed, the full potential strength and elongation of the specimen were not developed.

Specimen 203A: In this specimen the end fillets were greatly increased in width and length in an endeavor to force failure into the center of the specimen. These efforts were not successful, and show the difficulty of developing the full potential strength of a fillet welded joint even with a moderately abrupt change of section. Better results were

TABLE IV—SUMMARY OF TEST RESULTS

		203A	203B	203C	203D	203E
Specimen Mark						
Temperature of Testing (F)		62°	65°	55°	65°	20°
Maximum Wrapping at Start of Testing (Inches)	Leg off Flat*	0.00″	0.02″	0.27″	0.23″	0.22″
Maximum Wrapping at Start of Testing (Inches)	Bow in Heel	0.00″	0.03″	0.38″	0.33″	0.31″
Treatment after Welding		Straightened	Straightened and Normalized	None	None	None
Type of End Connection		1″ x 2″ Fillets Not Ground	1″ x 2″ Fillets Ground Concave	5/7″ x 1″ Fillets Not Ground	Faired Butt Welds To Special 12″ Long x 2″x2″x10″ Angle	Faired Butt Welds To Special 12″ Long x 2″x2″x10″ Angle
Observed Cracking of Scale on Smothered Arc Weld	psi	25,060	25,250	20,400	.....	.....
General cracking of Mill Scale on Legs of Angles (Yield Point)	psi	31,030	35,320	34,470	.....	33,855‡
Maximum Load	psi	63,080	63,560	59,020	58,670	60,560
Total Elongation—Per cent of Toe-to-Toe Length		14.13	20.64	8.45	17.24	22.50
Average Reduction in Thickness %	Average of Center 52″	6.58	9.39	3.95	6.65	9.34
Average Reduction in Thickness %	At Fracture	3.01	18.14	0.32	15.84	12.74
Reduction in Width of Sheerstrake %	Average of Center 52″	7.16	9.55	4.89	7.41	9.81
Reduction in Width of Sheerstrake %	At Fracture	1.47	16.76	1.84	11.40	11.98
Reduction in Width of Deck Stringer %	Average of Center 52″	6.75	9.62	4.91	7.08	9.45
Reduction in Width of Deck Stringer %	At Fracture	2.29	16.20	1.46	12.64	11.76
Reduction in Area %	Average of Center 52″	13.10	18.11	8.84	13.45	18.08
Reduction in Area %	At Fracture	4.68	31.57	2.09	25.66	23.07
Longitudinal Efficiency %		100.6	101.3†	94.1	101.7	105.0

*0.707 x bow at heel. †Based upon "as rolled" strength. ‡From load (head-movement) curve.

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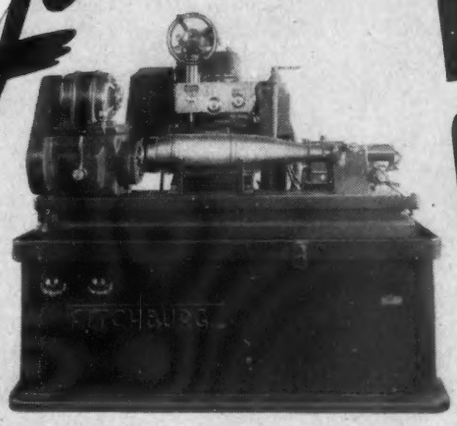

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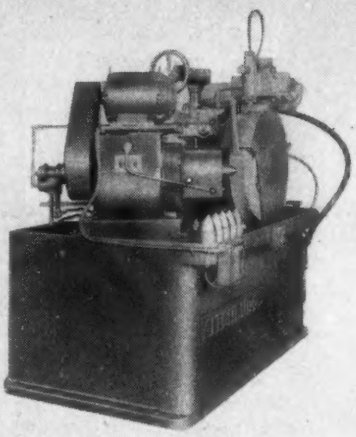

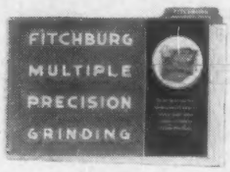

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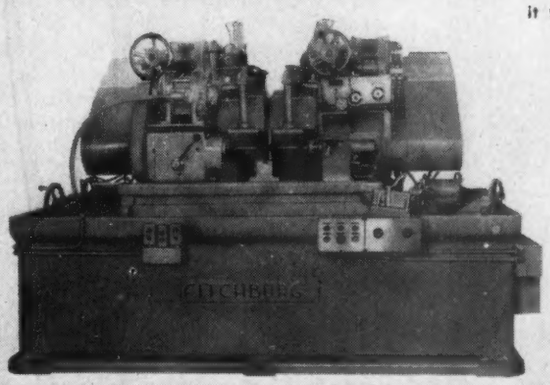

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obtained, however, from the larger fillets. A lower apparent yield point was found for the specimen than for its coupon. The ultimate strength and longitudinal efficiency were good despite the fact that failure occurred at the end and not in the center portion where thinning had been occurring.

This thinning and narrowing can be seen in Fig. 6 and is also shown in the reduction of area values in Table IV. An average reduction of 13.10 per cent had obtained over the center portion when failure occurred at an end with little local reduction of area. The zone of considerable reduction of area was unexpectedly extensive.

Specimen 203B: The normalized specimen had most of the locked-up stresses produced by the welding and cold working removed; however, a certain amount of residual stress would exist in the specimen as a result of the differential cooling between the heel and the toes, as would be the case in any rolled angle of these proportions. In other words, specimen 203B was in effect a rolled angle with a zone which had the properties of weld metal.

The yield point of the normalized specimen was very close to that of the as-rolled coupon. This is not surprising because the cooling in air of the specimen could have been very similar to the cooling in air of the original rolled plate. The ultimate strength was also very similar to that of the coupon resulting in a longitudinal efficiency of 101.3 per cent.

Normalizing enabled the welded joints at the ends to transmit sufficient tension so that failure of the specimen occurred in the parallel length. Some necking occurred as can be seen in the table and also in the increase of the reduction of area at the fracture over that obtaining over the center 52 inches. Ultimate failure was a sharp square break after great elongation had occurred.

Specimen 203E: In this specimen a higher apparent yield point was secured than was obtained from the coupon. This is one of the few specimens in the test where such was the case.

A strength in excess of that of the coupon was obtained resulting in a longitudinal efficiency of more than 100 per cent.

Good elongation, about as good as was obtained from any long welded or base metal specimen in the entire series, was secured. This elongation was distributed over the length of the specimen and little necking either of width or thickness occurred. This can be seen by a comparison of the reduction of area at the fracture with the reduction over the center 52 inches where the gage points were located. The break was square and sharp and can be seen in Fig. 9. If the performance of the specimen were to be judged by the appearance of the fracture alone, one might say that the material was brittle, whereas it exhibited great elongation.

The fracture can also be seen in the lower view of Fig. 1. This view shows the expansion tank after having been pulled apart.

This fracture (which occurred after 22.5 per cent overall elongation!) is of the same square type that is found on the failed ships. In Fig. 9 can also be seen "chevrons" or "arrows" pointing to the origin of the fracture in the welded zone. They are not as clear in this view as they actually are at times; however, other views of them will be seen in the other fracture pictures herein. So far as the writer's experience is concerned, they seem to be an infallible indicator of origin of failure in the case of square fractures. In the 45-degree shear failures, they generally do not appear.

Specimen 203D: Good strength, and longitudinal efficiency were obtained.

The reason why less elongation was developed by specimen 203D tested at 63 degrees Fahr. than by specimen 203E at plus 20 degrees Fahr. is shown in Fig. 8. Failure occurred through the blowhole. It is interesting to note, however, that this failure did not occur until the steel had developed its full strength as indicated by the longitudinal efficiency and had exhibited a degree of elongation far more than could ever be endured by an actual ship. In other words, this test indicates that, so far as static loading is concerned, the presence of a neat round blowhole need not be cause for alarm.

Failure started by a tear appearing at the blowhole and progressing across the specimen and resulted in a 45-degree shear failure over most of the section.

Angle Specimens in General: In Fig. 6 cracks occurred in both the Unionmelt weld and in the hand weld at points indicated by chalk marks. The appearance of these incipient cracks is shown magnified in Figs. 2 and 7. It is interesting to note that the hand weld, while very rough in appearance when compared to the smothered arc weld, seemed throughout these tests to be but little more likely to initiate ultimate failure of the specimen in static tension than the Unionmelt weld. The cracks in the weld metal usually became apparent only at an elongation exceeding 10 per cent.

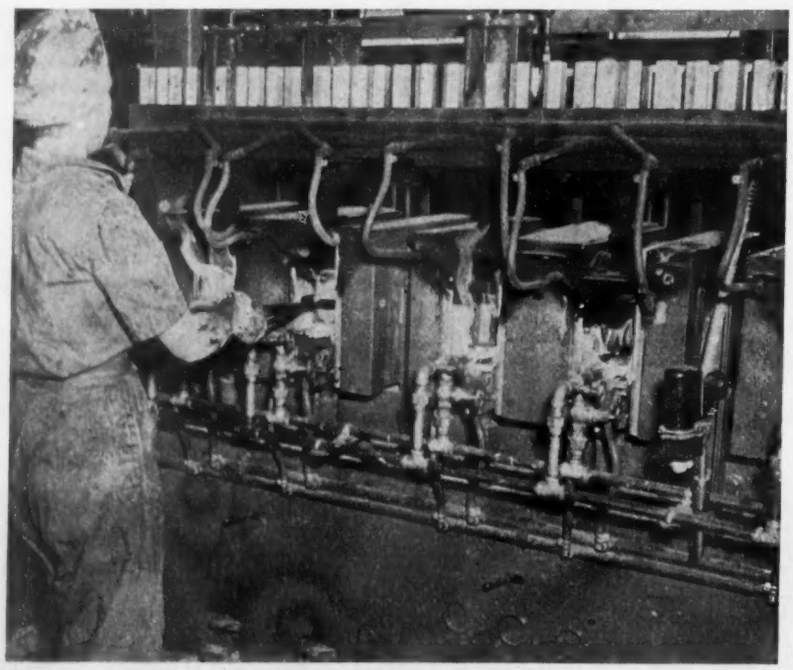
These cracks are due to the fact that the ductility of the weld metal is not as great as that of the surrounding base metal. In order to accommodate itself to the greater elongation of the base metal, the weld metal cracks at intervals. These cracks, of course, occur at elongations far greater than can ever be utilized in ship structures.

It will be seen in Fig. 6 that a small weld splatter on the corner contained several small cracks.

Examination of a typical load head movement curve will show that this curve is very similar in appearance to that of a load-extension curve obtained from sensitive strain gage measurements of a small specimen. A pronounced yield point was obtained. It will be remembered that specimen 203E elongated uniformly over its entire length and failed with a sharp square break. This is reflected in this curve by the absence of any marked falling off of the load, an accompaniment of local reduction or necking.

Supplementary Small Tests: In order to determine the standard tensile properties of the weld metal and the heat-

(*Please turn to Page* 129)



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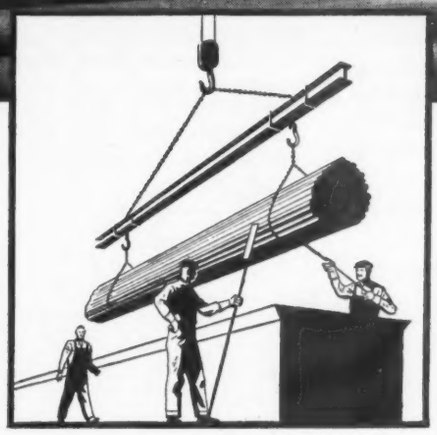

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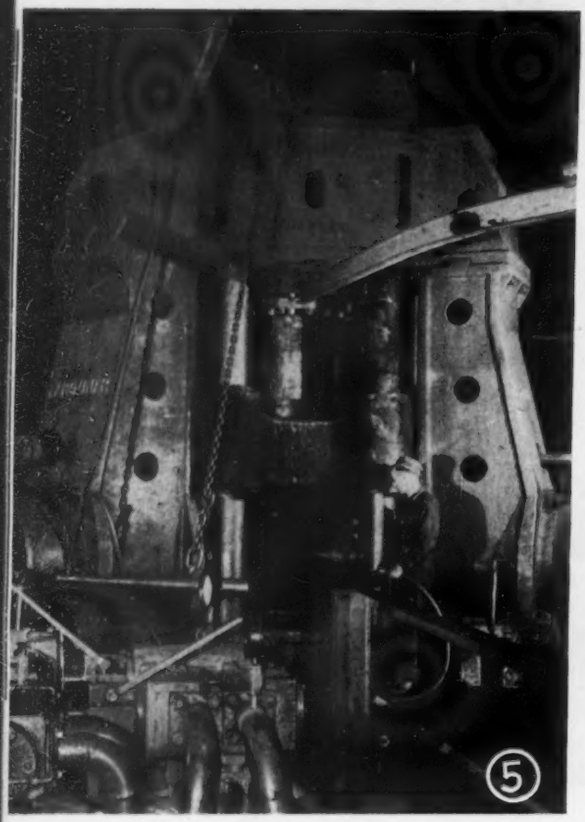


Fig. 5—Special 3-way hydraulic press for semi-piercing propeller hub. In addition to the main vertical cylinder, three cylinders work horizontally

Control of Forgings

(*Continued from Page 77*)

ciently, co-operation and harmony between the production departments and metallurgical staff is absolutely essential.

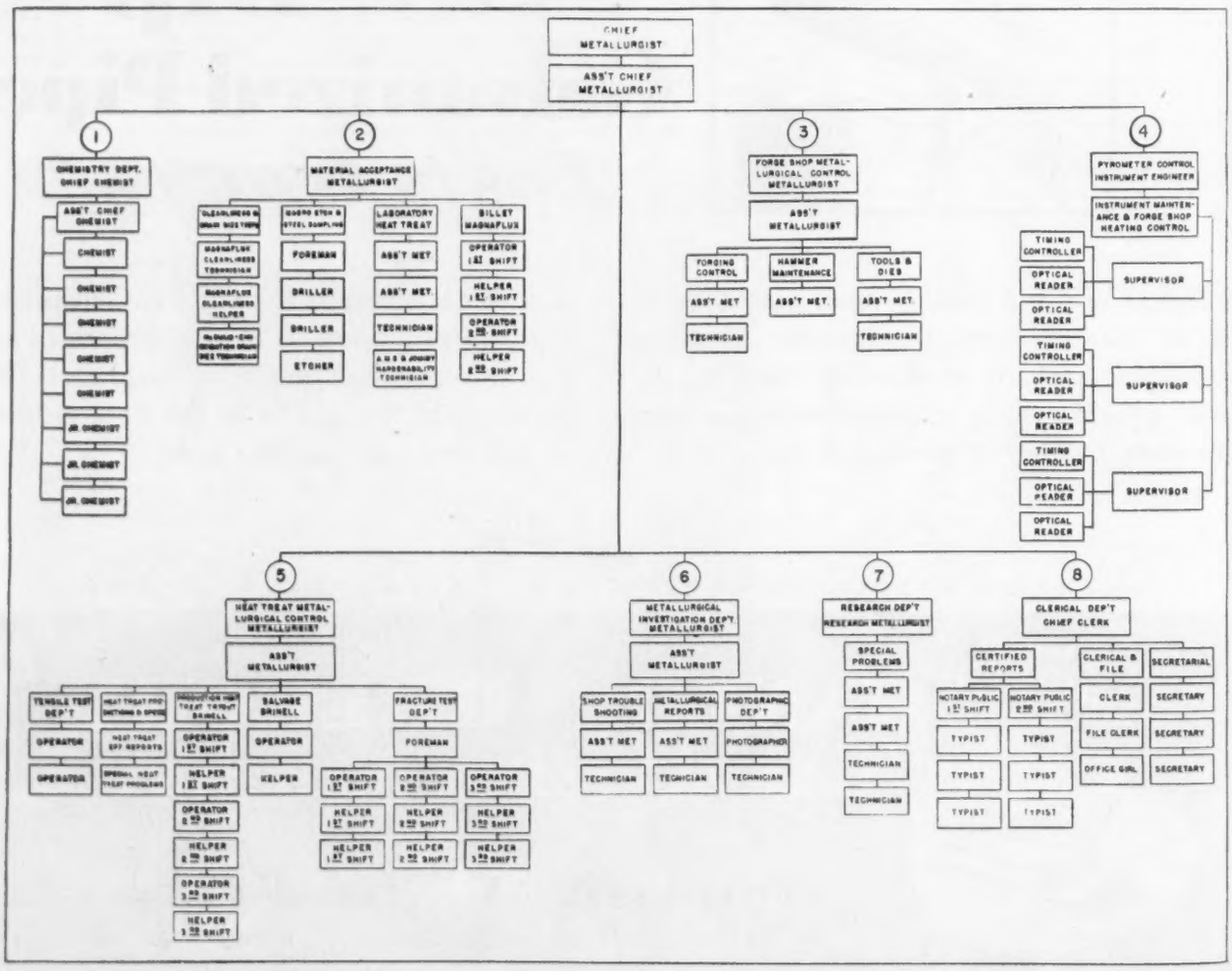
The functions of the laboratory departments are discussed below:

Chemistry Department: The chemistry department is staffed with a chief chemist and his assistant, five chemists and three junior chemists. Their work consists primarily of the routine chemical analysis of incoming raw material. They also check analyses of parts in process, returned forgings, dies, fuels, etc., submitted by other laboratory divisions.

Considerable literature has been written recently tending to minimize the importance of chemical analysis as a specification guide. It has been suggested that expected performance as indicated by hardenability tests is more important than the chemical analysis. The writer believes that both hardenability and chemistry will continue to be used in aircraft steel specifications. It is obvious that the steel melter will always have to be concerned with chemistry as it is essential that he know the composition of his raw materials and product in order to melt to hardenability requirements. The present system of specifying chemistry limits may be modified somewhat, but the change, if any, should not be a radical one. Considerable valuable information can be secured regarding any heat of steel from the chemical analysis of properly sampled drillings. However, aircraft heats of steel slightly out of specification due to deviations in chemistry, but which are capable of developing the specified mechanical properties are now frequently approved for use by aircraft metallurgists, and this is, of course, as it should be.

Material Acceptance Department: Supervised by a metallurgist, this department makes the usual acceptance metallurgical tests for aircraft quality steel including Magnaflux cleanliness, grain size, macroetch, hardenability of both the Jominy and AMS type, etc. Laboratory heat treatment of forged coupons is performed on each heat to be sure that specified mechanical properties can be met.

Note also the billet Magnaflux test department which is set up for two shift operation. Fig. 1 is a photograph of this setup which is situated in the production shear department at the saw



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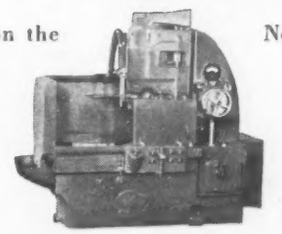

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conveyor line. It is intended primarily to insure against the use of saw and torch cut steel which has been flaked during processing at the mill. It is a fortunate circumstance that a steel bar which has been shear cut into forging multiples readily reveals any evidence of flaking or internal rupture on the shear surface, thus precluding its use if flaked.

Some aircraft forge shops check for flaking on billet stock which is subsequently sawed on torch cut by saw cutting one or more transverse macroetch slices from the center section of the billets. This method although a good one takes considerable time. With the setup shown in Fig. 1, the saw cut end of each multiple is wet magnafluxed and tested in two directions with a current of 2000 amperes. Any ruptures or flakes are immediately detected and the billet rejected for forging purposes. This operation is a continuous one installed in a production line through which every saw cut multiple and samples of torch cut multiples must pass.

Forge Shop Metallurgical Control: The forge shop metallurgist and his assistants are responsible primarily for process control of the heating and forging operations and serve as consultants on metallurgical forging problems. Process control of heating for forging includes temperature, rate of heating, time and atmosphere control of forging furnaces. This control is accomplished by co-operation with the pyrometer control department through shift supervisors, timing controllers and optical readers.

Grain flow checks are made on every new forging before production, and, in addition, routine grain flows of all forgings are checked periodically.

In addition, steel and heat treat specifications are prescribed for tools, dies and hammer parts. Investigations of failures of these parts are conducted and recommendations made for improvements based on the findings of the reports. This, incidentally, is a very important function of this department and is becoming more so all the time with the increasing size of hammers and the severity of work required by the thin sections of many modern aircraft forgings.

Pyrometer Control: This department headed by an instrument engineer is set up to operate three shifts and has charge of the installation, repair and maintenance of all temperature control instruments and timing controls in both the forge shop and heat treat. Periodic calibration checks are made on all brinell machines and on certain of the laboratory equipment.

Heat Treat Metallurgical Control Department: This department is responsible for all metallurgical controls and product testing from the time the forgings leave the forge shop, through heat treat, cleaning and inspection departments, until finally released for shipment.

The tensile department makes all tensile and Izod tests. The amount of this testing, however, has been greatly reduced with the increasing use of the fracture test.

Fracture tests are made as part of the final inspection procedure. The personnel are carefully trained in the rating of fractures and any borderline or questionable tests are subject to the review and decision of a laboratory metallurgist. Because the use of the fracture test as a forging production check is relatively new, a more detailed discussion of this practice would perhaps be of interest.

The integral fracture test when properly designed and interpreted is an extremely accurate and sensitive testing procedure. Combined with the brinell hardness on the forging itself, it serves as an excellent metallurgical control of forgings that are to be machined into highly stressed parts. This fracture test is intended primarily as a check on forging practice and should not be confused with the Shepard PF Tool Steel fracture test which is made in the "as-quenched" condition.

Our company has used the fracture test as a quality check on important forgings such as crankshafts for a number of years. In 1942, WPB made a concerted drive to conserve steel and as a result of our experience with the fracture test, we recommended the substitution of this test for the integral tensile test. This change in testing practice has resulted in saving hundreds of tons of alloy steel. It was axiomatic that the tensile test specimen be of a size comparable to that of the forging proper and this resulted in test pieces 5 to 6 inches long, with diameters up to 5 inches. The fracture test coupon is much smaller and the cost of machining is eliminated.

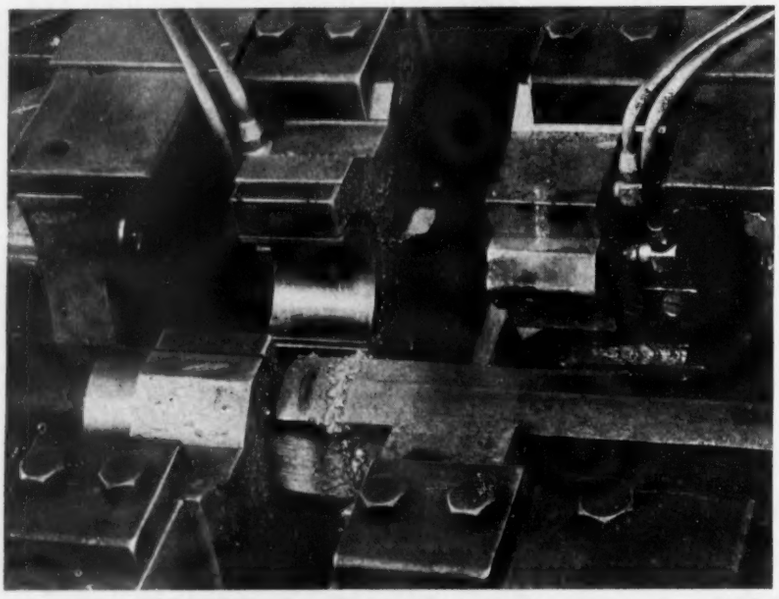
Fracture Test Gives Check

Formerly, yield point and tensile strength as indicated on the integral test piece served as an excellent check on heat treatment, while the ductility, as expressed by the elongation and reduction of area, also served as a check on forging practice. The brinell hardness on the forging itself was used as a direct indication of the tensile strength of the part. Now the integral fracture test gives a more sensitive check on forging practice and the brinell on the forging itself still serves as the indication of tensile properties.

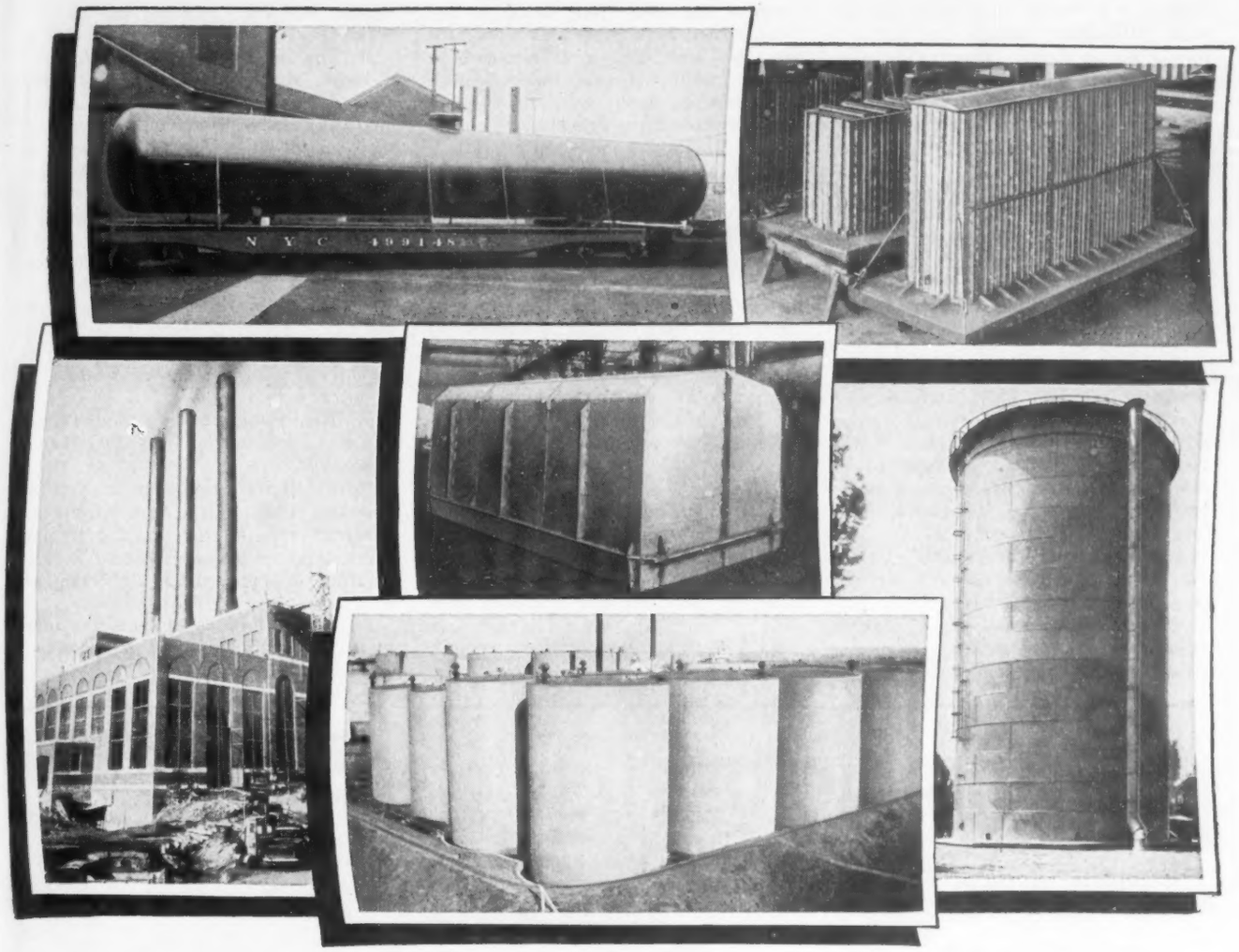
To be fully indicative, the fracture test should be made in the heat treated condition.

A view of the fixture which we have developed for this operation is shown in Fig. 2. There are six stations on the circular table which rotates automatically on a timed cycle. Oxacetylene gas is used for all cutting and heating operations. The sequence of operations running counterclockwise on the table are as follows: 1, Load (and unload indicated by arrow); 2, flame out off; 3, flame harden; 4, air quench; 5, flame draw; 6, air cool. The fracture test piece treated in the above manner is then broken in a mechanical or hydraulic press and the fracture surface examined and rated.

Fig. 3 illustrates sample fractures taken from production fracture test pieces compared with tensile tests cut from the same test pieces. Although the third fracture is considered unacceptable because of grain coarsing, the mechanical properties are still within speci-



WELDED TWIST DRILL: Joined to shank before twisting, drill stock and shank are held during welding on this resistance-type unit by water-cooled clamping dies strong enough to hold material at twice push-up pressure. Dies act as electrodes, transmitting current to parts being welded. After twisting, drill is hardened and finished, according to standard practice. Photo Courtesy Resistance Welder Manufacturers Assoc.



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fications. It would have been considered satisfactory material by previous standards. It should, therefore, be emphasized that with the substitution of the fracture test for the tensile test, there has, without question, been a definite overall increase in quality of the finished product.

It is necessary to re-emphasize the fact, however, that the fracture test is comparatively new. When it is properly engineered and properly interpreted, it is ideal. The new user must, therefore, be cautioned, in the first place, to properly correlate the interpretation of the fracture test with mechanical properties so as to avoid unnecessary rejection of satisfactory material and, in the second place, to properly design the test piece so that it will be subject to the same conditions of temperature and mechanical work as the forging proper, otherwise, it will be an inaccurate indication.

Aircraft Forging Developments: Of the various developments in the aircraft forging field, one of the most interesting is the forging of one-piece propeller hubs with semi-pierced arms. This development is important, not only because of the tremendous saving in raw material and consequently in machining time, but also because it results in a metallurgically improved finished product. Previous to the war, all one-piece propeller hubs were furnished as a solid forging. With the increased production brought on by the war and with the help and encouragement of the Aeroproducts Division of General Motors, our company designed a method and equipment for furnishing these forgings with the semi-pierced arms. The saving in material, depending on the size of hub, amounts to from 75 to 125 pounds per forging. The extension of the arms causes considerably more work to be performed on the metal in the interior of the forging and the resulting improvement in structure has improved physical properties and reduced magnaflux rejections.

The equipment used for this operation is a large hydraulic press of special design, shown in Fig. 5. This press has a vertical cylinder to hold the dies together and horizontal cylinders operating an extrusion punch for each arm. Fig. 4 illustrates the various steps in the complete forging procedure on a typical one-piece hub forging as follows:

(1) The forging multiples are cut from 9 inches round cornered square 4340 steel billets, and are heated in an oil fired furnace with automatic temperature control to an optical temperature on the dies of approximately 2200 degrees Fahr.

(2) In the first forging operation the heated multiple is longitudinally edged in V-dies on a 9000 pound steam drop hammer.

(3) The second hammer operation consists of rough blocking in an 18,000 pound hammer. The die fills the arms and inboard ring and rough pierces the center bore.

(4) The third operation is the finish die hammer operation in an 18,000 pound hammer.

(5) The fourth operation consists of trimming the forging flash in a mechanical press, after which the forging blank is given a wash heat to a temperature of approximately 2150 degrees Fahr.

(6) In the fifth operation the solid arms are extruded in the three-way press shown in Fig. 5.

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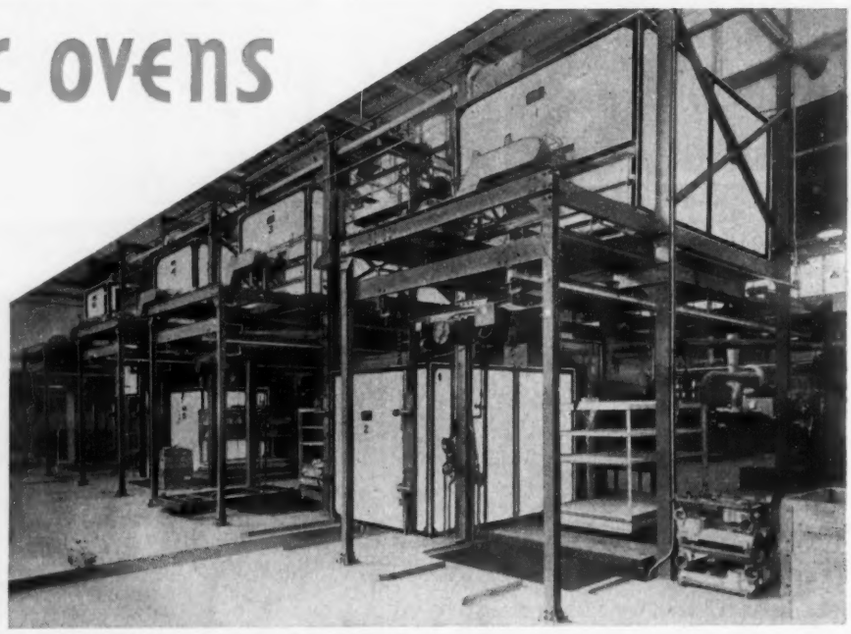
Complete furnace cycle, from heating to quenching, is provided by units incorporating several unusual handling features



AUTOMATIC batch heating and cooling, complete with an electrical conveyor system affording faster and easier movement of material between treatments, is provided in a battery of ovens designed for heat treating aluminum castings used in marine, aircraft, and artillery control instruments, and similar precision devices. Considerable time and labor savings are claimed for the installation illustrated, built by Gehnrich Oven Division of W. S. Rockwell Co., New York.

The four elevator type ovens are supported on heavy structural steel framework extending to the building floor, leaving ample clearance underneath each oven for easy loading and unloading. Directly below the loading station of each oven is a quench tank. Thus, with the oven mounted above and the quench tank below floor level, the space between may be used for preparing the rack or cage of work for lifting into the oven, while a cage of heated work is cooling in the tank below.

Each oven is made of heavily insulated dual panel metal construction with alloy steel interior. Its bottom is provided with two tight fitting double sliding doors, each motor operated through a rack and pinion. Ovens are electrically heated with hot air drawn from heater sections by circulating fans and reinduced into the heating chamber at a recirculation rate of 58 complete air changes per minute. The cage, weighing 1000 pounds, can carry a work load of 800 pounds of miscellaneous aluminum castings. Constant forced convection of heat at 1000 degrees Fahr. assure uniform exposure of all parts to required heat. Temperature is maintained by indicating and recording controllers.

When the heating cycle is finished, the operator presses a button, doors on the oven floor slide open and the electric hoist which first raised the cage into the oven lowers parts to the plant floor, which slides apart. The cage then descends into the quench tank, set in a pit, and comes to rest on a platform near the bottom of the tank above an immersion type steam heating coil unit. Quench solution temperature is thermostatically controlled. When quenching is completed, the tank doors slide open, a transfer device removes the cage from the quench on to a 6-wheel chassis which then is pushed away for the next operation.

In addition to the four elevator type ovens, the installation includes two lift-door, box-type, electrically heated horizontal heat recirculation ovens used for heating at lower temperatures and for baking enamel finish on small parts.

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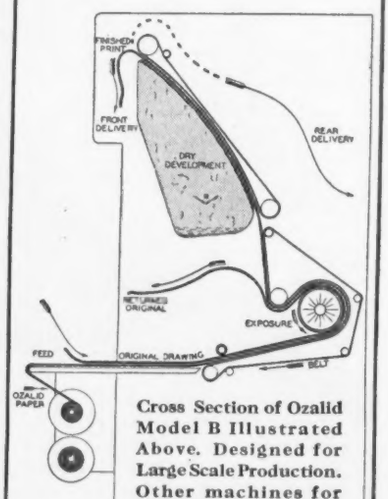


Cross Section of Ozalid Model B Illustrated Above. Designed for Large Scale Production. Other machines for lighter production or for use with blueprint equipment. Same *dry* principle, same advantages.

Casting eight inches thick examined in three and one-half minutes by

Two-Million Volt X-Ray Unit

PIECES of steel a foot thick may be examined by a 2,000,000-volt mobile X-ray unit which doubles the voltage of X-rays usually available to industry for examination of metal sections. The two-million-volt unit is 78 times as fast as the million-volt machine in radiographing an eight-inch steel casting. Under a typical set of conditions, four and a half hours were required to make an exposure through this thickness with a million volts. Two million volts did it in three and a half minutes. For still thicker sections the ratio is even greater. Two-million-volt X-rays make a satisfactory exposure through a foot of steel in about two hours when type A X-ray film is used at a distance of three feet from the end of the tube. For practical purposes such a thickness is opaque to million-volt X-rays.

According to General Electric Co. Schenectady, N. Y., the new unit, weighing 5000 pounds, is mobile in the sense that it can readily be moved by crane and positioned at any angle by push-button control of fractional horsepower motors. Steel castings of the thicknesses for which it would be used might weigh hundreds of tons and where such masses are handled a two and a half ton X-ray outfit is relatively light.

Predecessor of this equipment was a million-volt hospital unit developed for cancer treatment. It had to be connected continually to a vacuum pump to keep the X-ray tube exhausted. Early in 1941 the first million-volt industrial unit was introduced, with the tube completely sealed off and requiring no vacuum connections.

Multiple-Electrode Tube Used

The two-million-volt apparatus, like that of one million volts, employs a multiple-electrode tube in which the electrons, starting from a heated filament at the top, are speeded in stages until they have the total rated energy. After they attain full speed, which for two million volts is about 179,000 miles per second or 96 per cent of the velocity of light, they strike a copper-backed tungsten target at the end of the tube, generating X-rays. These may either be sprayed from the end or sprayed from the side. After penetrating the metal specimen, they fall on photographic film, making a radiograph.

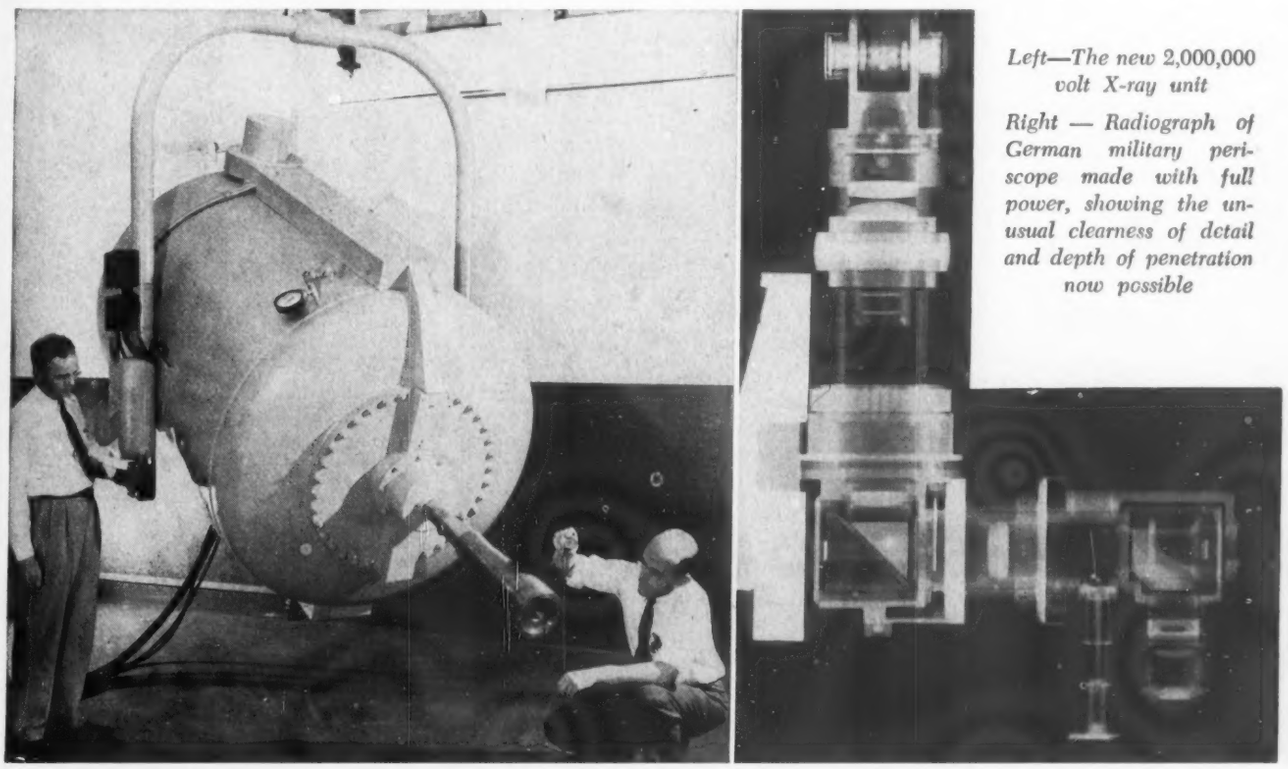
Electrons, on their way to the target in the million-volt unit, were speeded in twelve steps. The new tube has 24, averaging 83,500 volts at each stage. Construction of the tube was made possible by the use of rings of fernico, an alloy which expands with heat as does glass, between glass sections, so metal and glass can be fused together.

High voltage is supplied by a resonance transformer. Unlike the usual transformer, it has no iron core and the X-ray tube is placed at its axis. Both tube and transformer are in a closed metal tank, five feet in diameter and eight feet long, containing Freon gas (dichlorodifluoromethane) for insulation.

In addition to allowing radiographs to be taken easily through metal sections too thick for lower voltages, two-million-volt X-rays also are advantageous for thinner specimens.

X-rays of lower voltage frequently require a great range between exposure times for metals of different thickness. If the same specimen has one part that is thin and another that is several times as thick, it is not possible to expose correctly for both at once. The thin parts must be built up with blocks of lead to make a uniform exposure. Need for this method is eliminated with the million-volt outfit, and to an even greater extent with two million volts. Although the rays are able to penetrate very thick specimens, they will still not over-expose sections considerably thinner. Excellent radiographs may be taken through objects made of different materials, some

(*Please turn to Page* 120)



Left—The new 2,000,000 volt X-ray unit

Right — Radiograph of German military periscope made with full power, showing the unusual clearness of detail and depth of penetration now possible

Analysis and Advantages of

OPERATING FURNACES on DRY BLAST

By L. L. LEWIS*
Vice President
Carrier Corp.
Syracuse, N. Y.

Five stacks blown with low-moisture blast and representing a wide range of temperatures have a higher yield and lower coke consumption than when operated in conventional manner. Explanation is offered why some furnaces equipped with dry blast have not enjoyed the advantages in full measure. Five major benefits of dry blast operations are cited

DRIED blast, or dry blast, as it is commonly known, is the practice of controlling, at a predetermined point or level, the water vapor content of air which serves a blast furnace or cupola. As the name implies, it means reducing the water vapor content or absolute humidity of blast air. In current practice, it also includes the reverse, that is, raising the water vapor content of the blast, during the winter months, up to that same predetermined level.

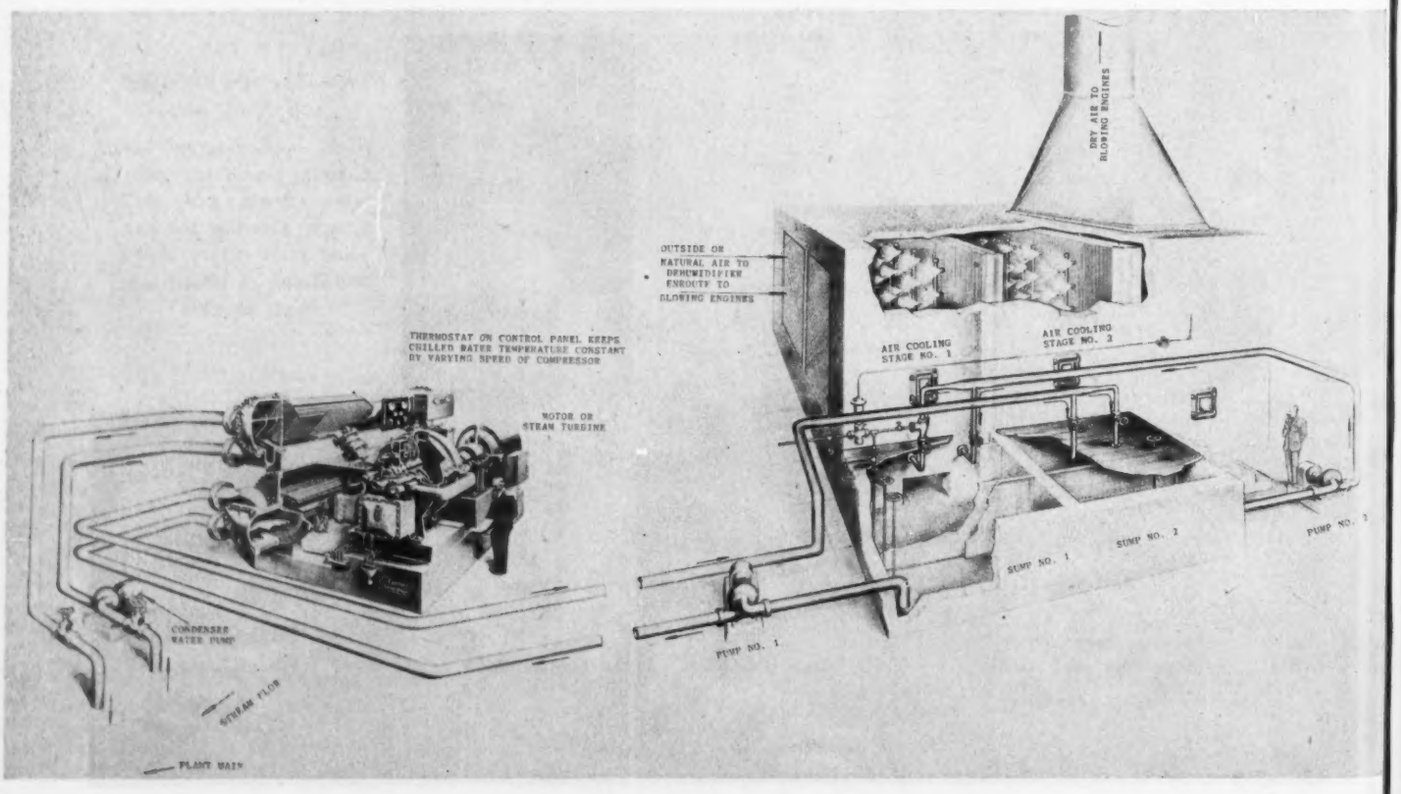
From another angle, it is the practice of eliminating, from furnace operation, throughout the 12 months, both the fast moving and long-term variables which otherwise are introduced by variations in weather. A prime objective is control of furnace temperature which is made possible by the fact that part of the water vapor is broken down into hydrogen and oxygen, and that the heat of dissociation is absorbed in the melting zone. The presentation of this is limited entirely to blast furnaces and, incidentally, will require the utmost of frankness in dealing with certain points, because the full potentials of dry blast have not been fully enjoyed by all who have used it.

A conclusive analysis would require a theoretical as well as a practical knowledge of three of the arts and sciences—air conditioning, metallurgy and blast furnace operation. It would place about the same emphasis on each, but a working knowledge of each, could come only from a lengthy practical experience.

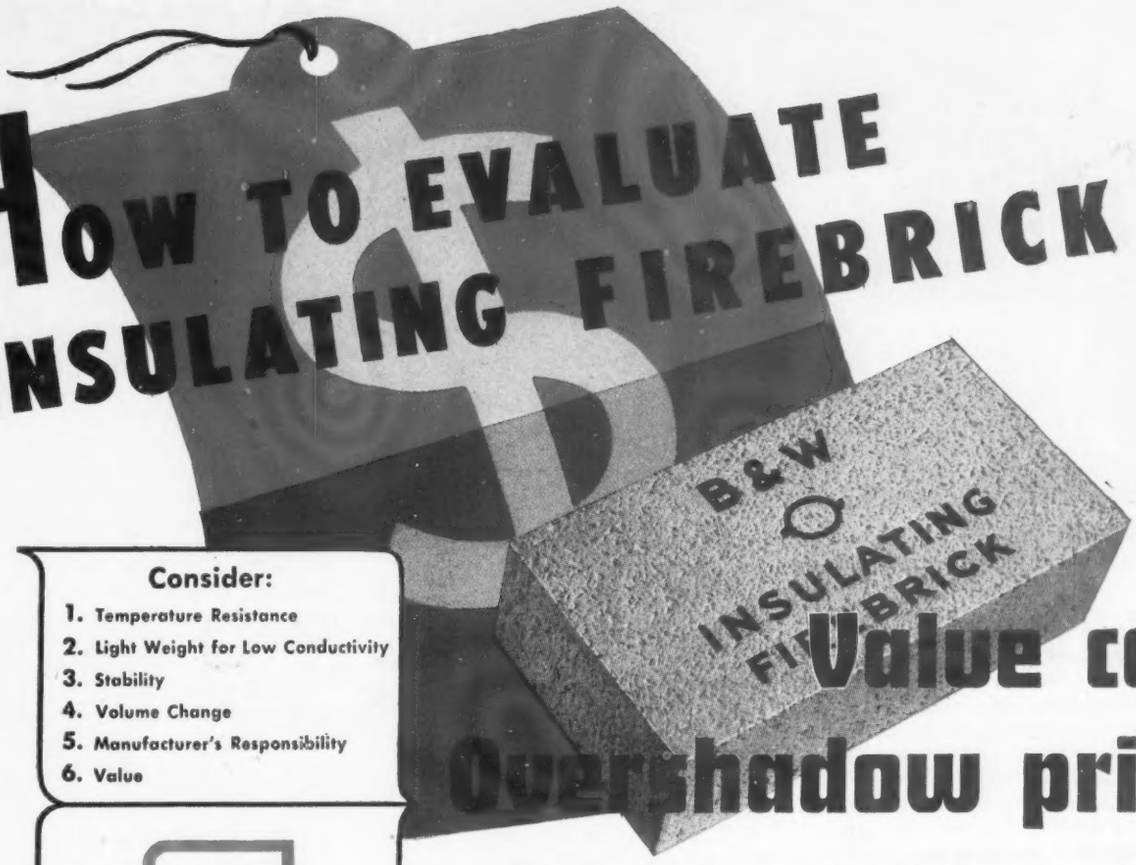
While the author is thoroughly acquainted with air conditioning, particularly, in all of its industrial applications, he disclaims an expert knowledge of metallurgy or chemistry and operating experience with blast furnace. His comprehensive outside point of view of the

*From a panel discussion on Refrigeration in Metallurgy, presented at group meeting, American Society of Metals in Cleveland.

Diagram of typical dry blast facilities employing chilled water


DRY AIR TO BLOWING ENGINES
OUTSIDE OR NATURAL AIR TO DEHUMIDIFIER ENROUTE TO BLOWING ENGINES
THERMOSTAT ON CONTROL PANEL KEEPS CHILLED WATER TEMPERATURE CONSTANT BY VARYING SPEED OF COMPRESSOR
AIR COOLING STAGE NO. 1
AIR COOLING STAGE NO. 2
MOTOR OR STEAM TURBINE
CONDENSER WATER PUMP
STEAM FLOW
PLANT MAIN
SUMP NO. 1
SUMP NO. 2
PUMP NO. 1
PUMP NO. 2

How to evaluate insulating firebrick



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2. Light Weight for Low Conductivity
3. Stability
4. Volume Change
5. Manufacturer's Responsibility
6. Value

6

The value of an insulating firebrick to you, in your furnace, may be ten times its price—or one tenth the price—depending upon:

The amount of fuel that can be saved by a brick due to its low weight and insulating efficiency, as shown by its density and conductivity.

The amount of labor and material, and the number of shut-down periods required for maintenance or replacement. Service life is indicated by the amount of permanent volume change and of the hot-load strength of a brick at the operating temperature of your furnace.

The assurance you can enjoy—or miss—as a result of the experience and responsibility back of the manufacturer's recommendations.

Your local B&W representative will be glad to help you calculate the value to you of insulating firebrick for your specific needs. No obligation.

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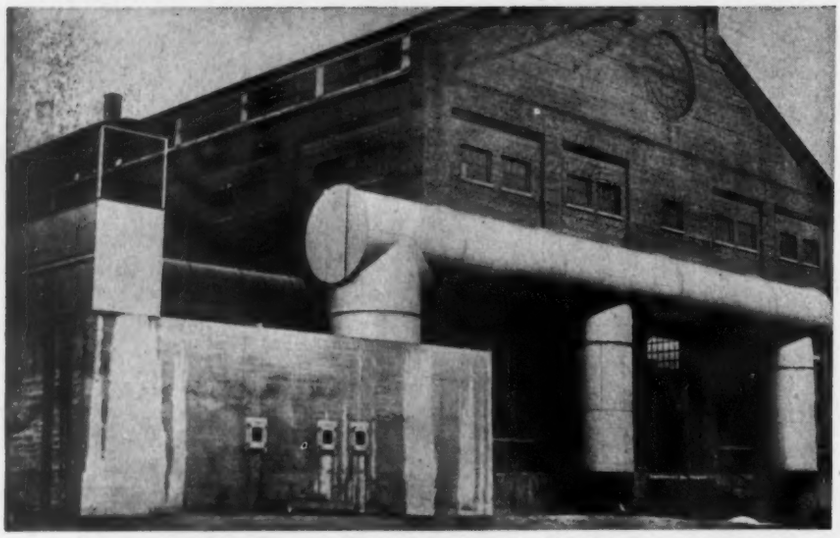


Concrete dehumidifier with outside air intake shown on upper left and suction to blowing engines (before insulation) at right, at plant of Woodward Iron Co., Woodward, Ala.

major problems of furnace operation is built upon a lifetime of practical experience in applying air conditioning to all manner of industrial production problems and includes contacts with James Gayley in his pioneering work.

In those early days, Gayley tried dry blast and proved it to his own satisfaction. But all of his plants long since have been dismantled as economic failures. That is on the record but same record also carries substantial explanations therefor.

In the first place, the air conditioning which Gayley employed could not have been expected to stand up successfully under the practical test of operation and maintenance. Gayley was convinced that moisture could be removed from air, only by the process of freezing it upon pipes and capturing it in the form of ice. Consequently, his dry blast plants were monstrosities as compared with modern plants and were costly in maintenance and operation.

Gayley was unwilling to accept the principle that water vapor could be condensed out of air by direct contact with a chilled liquid in the form of spray. Proof was rather meager at that time. But since then, its soundness and practicality have been solidly confirmed many times over and great improvements have been made in equipment, particularly refrigeration.

In the second place, the ironmaking practice with which Gayley dealt, contained many other variables of major significance. Since then design and practice have been greatly improved and many of the major variables with which he had to contend, have since been reduced to a low order of significance.

As to current experience, five years have now elapsed since the Woodward Iron Co., Woodward, Ala. dug up dry blast as a corpse and revived it. The first of its stacks was equipped in the fore part of 1939, the second in 1940 and the third in 1941. The furnaces are burden on foundry iron using lean ore.

During the early operation, two comprehensive before-and-after tests were made; all told, the furnaces have had a total of about 12 furnace-years of operation.

Findings and experiences can be significantly summarized by saying that all of Woodward's furnaces are equipped with dry blast. Better foundry iron is being made at a lower cost and the return on the investment has been highly satisfactory, according to the officials. They have been constantly able, in spite of war conditions, to make more iron than they ever made before and with much less coke.

The first trial in northern practice was made by Jones & Laughlin Steel Corp., Aliquippa, Pa., in 1940. The furnace is burdened on basic iron and deals with a much richer ore. In each of the four years, J & L's annual production from this particular furnace, has been almost 8 per cent higher and has been accomplished with 33 pounds less coke per ton of iron—both with due allowance for scrap.

A third successful experience has been contributed by the Jackson Iron & Steel Co., Jackson, O., makers of silvery or high silicon iron. Its furnace was equipped with dry blast in 1942. Unlike the preceding cases, the benefits which Jackson realized are difficult to appraise because, at Jackson, other significant changes were made when dry blast was installed.

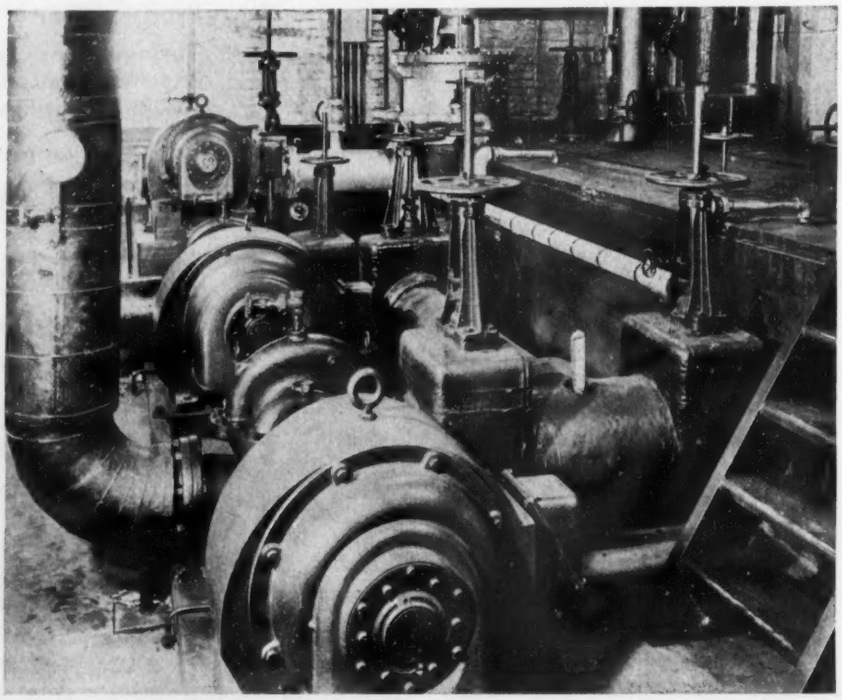
Officials of the Jackson company are convinced that "we get more silicon for a given burden than we could get without it. The ratio of ore to fuel, which originally gave 8 per cent silicon now produces 10 per cent. During the first year of operation, the equipment paid for itself. Uniformity of our product has gone hand in hand with increased production."

The foregoing plants, representing a wide range of furnace temperatures, have been outstandingly successful. But, there's more on the record which cannot, in fairness, be concealed and which should be dealt with in open frankness. All told, dry blast has been applied to a total of 20 furnaces. Of these, only the five previously mentioned, have enjoyed the advantages in full measure and to their own satisfaction and profit. The ultimate answer to "why" is one for the triumvirate of experts, but some light can be thrown upon it. Three points are highly pertinent:

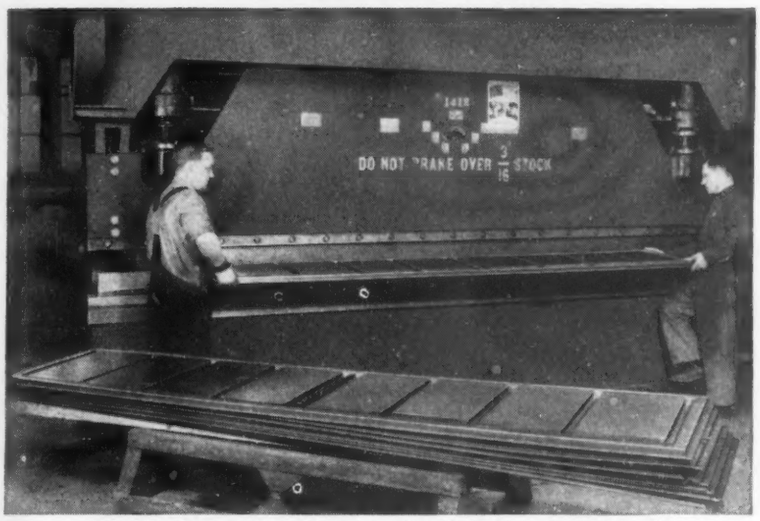
1. Some lack of success is undoubtedly

(*Please turn to Page* 122)

Chilled water pumps serving a dry blast installation at blast furnace division, Jones & Laughlin Steel Corp., Aliquippa, Pa.



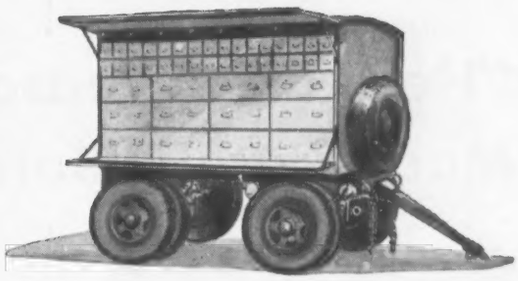
Flanging outside sheet for trailer door. Steel used is 18 gauge. Size of completed door is 2' 0" x 10' 0".



Final flattening of outside flange after channels and reinforcing panels are spot-welded in position.

HOW DOORS ARE MADE

Of interest is the production of panel-type trailer doors on the Steelwelds. The outside sheet of a door is partly flanged, first on one end, then on the two sides. Channels and reinforcing panels previously formed on the presses, are spot welded into place. The flanges then are given a final flattening on the press to make the door a solid, rigid unit.



FIELD TRAILER PRODUCTION *SPEEDED with* STEELWELDS

Since Pearl Harbor, the same Cleveland Steelweld Presses that previously had been busy producing such peace-time items as truck bodies and cabs at the Baker-Raulang Company, Cleveland, have been in continuous production on Field Stockroom Trailer parts including panel-type doors and 125 drawers for each trailer. This work involves various braking operations. Bends must be straight, sharp and accurate.

Baker-Raulang declares that Cleveland Steelwelds meet all the requirements for their exacting work. They are safe and easy to operate. Dies are quickly changed. Only minimum maintenance is required.

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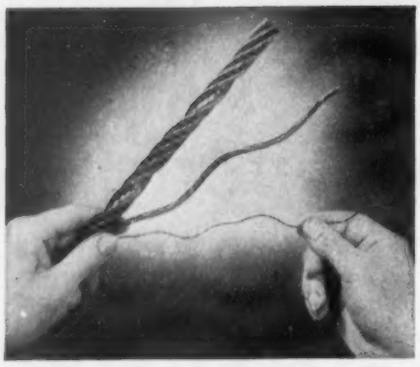

HERE'S HOW Macwhyte PREformed Wire Rope is made. Notice that the wires have a spiral shape. They have been PREformed. When the rope is made, both wires and strands fit naturally into position with a minimum of internal stress and friction.

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The demands of our armed services are so great now, there may be times when we cannot give you our usual prompt service and delivery. The situation changes from day to day, so please keep trying. We'll serve you if we possibly can.

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  I've found that it outwears non-PREformed ropes by a big margin. That's because internal friction and fatigue are virtually eliminated. In Macwhyte PREformed, each wire and strand are shaped to lie *naturally* in the rope."

- ***"SECOND, it's more economical.***

  Because of the extra-long service Macwhyte PREformed gives, I get lower cost per load carried. My records show it actually saves me money!"

- ***"THIRD, it means fewer shut-downs.***

  That's mighty important to me, because I need every man-hour possible to maintain production schedules."

- ***"FOURTH, it's easy to install.***

  Macwhyte PREformed does not kink during unreeling. It is extremely flexible and can be put on equipment *fast*, thus saving precious time."

- ***"FIFTH, it is safer to handle.***

  Macwhyte PREformed can be cut without seizing. Broken wires stay in place, do not wicker out to injure workmen's hands."

- ***"SIXTH, Macwhyte PREformed has Internal Lubrication:***

  Heavy lubricant improves the sliding action of wires as they move in bending around sheaves and drums. In many cases the inside wires are in good condition after the outside wires are seriously worn."

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Shipyard Finds Wide Use for

Metallizing Process

Spraying zinc, copper, brass, and steel speeds production by restoring equipment items to original condition, reclaiming spoiled work and generally cutting time on repairs

WIDE use of the metallizing process, with applications ranging from very small operations to work involving hundreds of pounds of deposited metal and requiring continuous spraying for periods as long as 72 hours, is made at Tampa Shipbuilding Inc. Types of metallizing wire used include zinc, brass, copper and various carbon steels. In the past 12 months, over 72 miles of zinc wire have been atomized and sprayed, providing corrosion protection to millions of dollars worth of Navy equipment.

Fig. 2 illustrates a maintenance application involving rebuilding of copper switch fingers, which wear rapidly, are expensive to replace, and are of critical material. Both time and money are saved by building up worn fingers with sprayed copper. The fingers in Fig. 2 are of two different sizes. From right to left, in each case, are worn fingers as received to be repaired, fingers cleaned and prepared to receive sprayed copper, fingers after being sprayed, and finished product after polishing to a contour identical to a new finger. It is estimated that this operation alone annually saves 1800 pounds of copper and $1000.

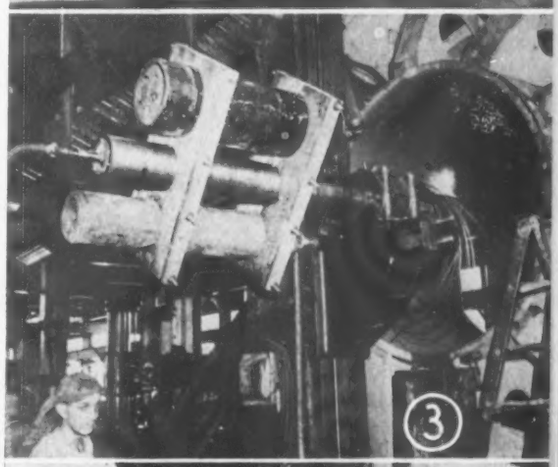
A large number of shafts, both large and small, are metallized, and then machined to original dimensions. One particular size shaft, shown in Fig. 1, wears rapidly. Large numbers of machines using these shafts are in operation throughout the yard. The shaft at top in Fig. 1 shows the condition in which these are received for repair. The second from the top shows the shaft prepared to receive sprayed steel. The third shows the shaft after being built up by metallizing. This is followed by machining, resulting in the shaft shown at the bottom. Fig. 4 illustrates the method used in building up this shaft. The gun uses steel wire and shaft is clamped in a chuck revolving at moderate speed.

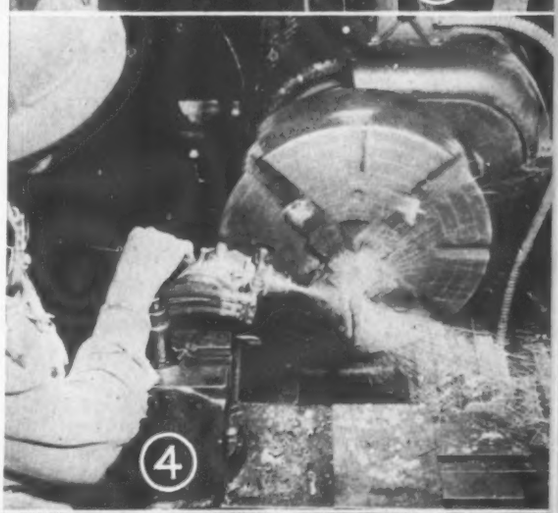
One of the largest metallizing jobs in this yard was on the interior of a cylinder requiring machining to a press fit. A mistake during machining caused excessive material to be removed from one-half of the cylinder, covering an area of over 30 square feet. Due to the large number of man-hours and time required for fabrication, it represented several thousands of dollars prior to machining. The ship on which it was to be installed was being rushed to completion to meet an early delivery date. Metallizing offered a most satisfactory salvage method.

By attaching oxygen and acetylene tanks and air hose to the boring bar, as shown in Fig. 3, it was unnecessary to remove the weldment from the boring mill. The gun was mounted on a regular cutting arm, with gases fed through ¼-inch brass tubing placed on the boring bar keyway, eliminating tangling. Steel metallizing wire was looped over the boring bar. Prior to spraying, a series of circumferential cuts were made across the area to be built-up to give sufficient roughness to assure adequate bond of parent and sprayed metal. Approximately 200 pounds of steel were sprayed during this operation. After spraying, the gun was removed, the arm refitted with a cutting tool, and the cylinder machined to correct dimensions, giving a perfect press fit surface.

The application of zinc by metallizing is used extensively. It involves spraying various sections, from large bulkheads to small brackets, including welded seams on galvanized fresh-water tanks, chests and vent trucks, where galvanized coating was damaged by welding heat.

Fig. 5 shows small angle brackets of galvanized iron that require metallizing with zinc at the point where heat from bending has damaged the galvanized covering. The operator is grinding rust from one bracket preparatory to spraying. Brackets at the right of Fig. 5 are as received prior to cleaning, those at the left have been cleaned, and those in the center have been sprayed.





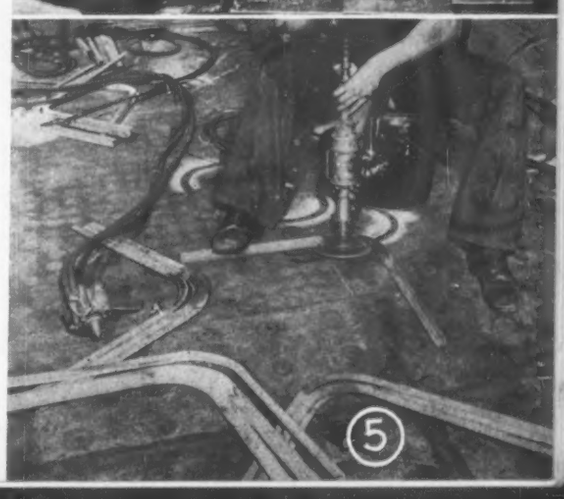


Fig. 1—Steps in restoring a machine shaft

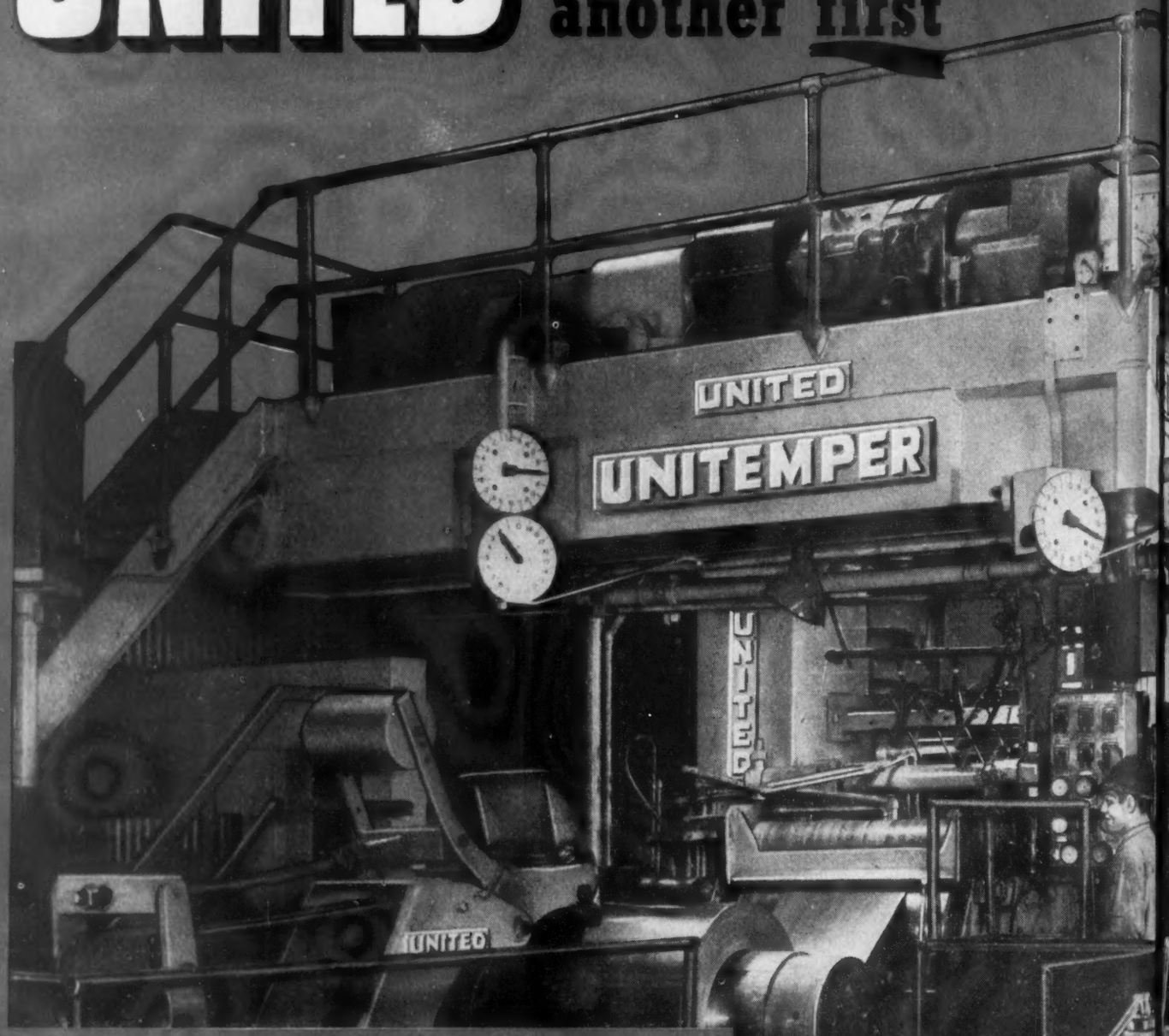
Fig. 2—Copper switch fingers in various stages of being rebuilt by metallizing process

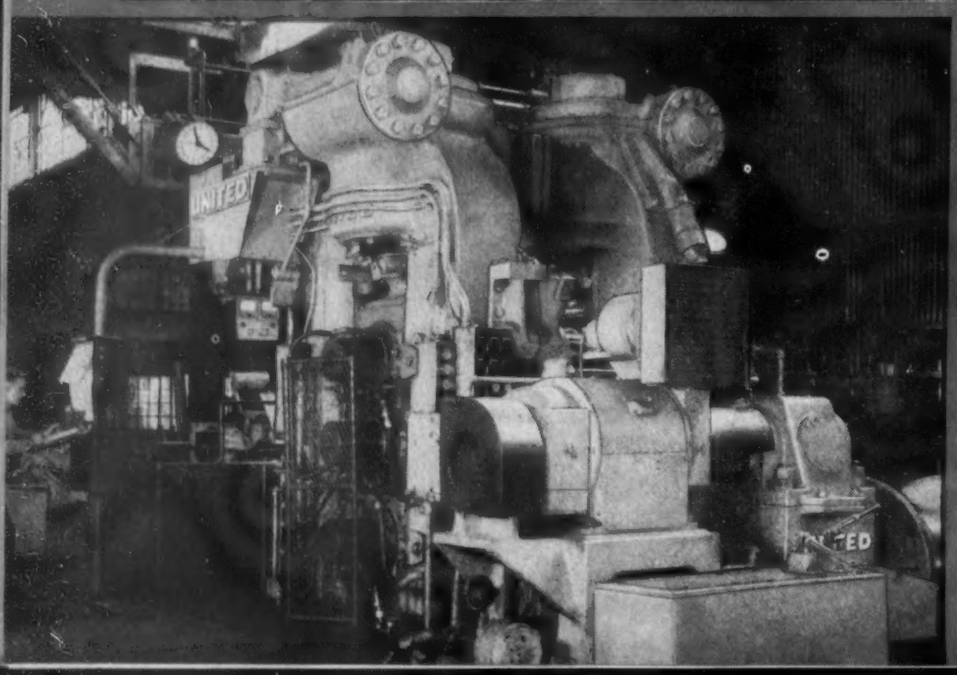
Fig. 3—Rig for resurfacing a cylinder interior

Fig. 4—Metallizing gun building up a shaft

Fig. 5—Processing galvanized iron brackets to resist corrosion. Mogul metallizing guns are used in all applications described

UNITED presents another first



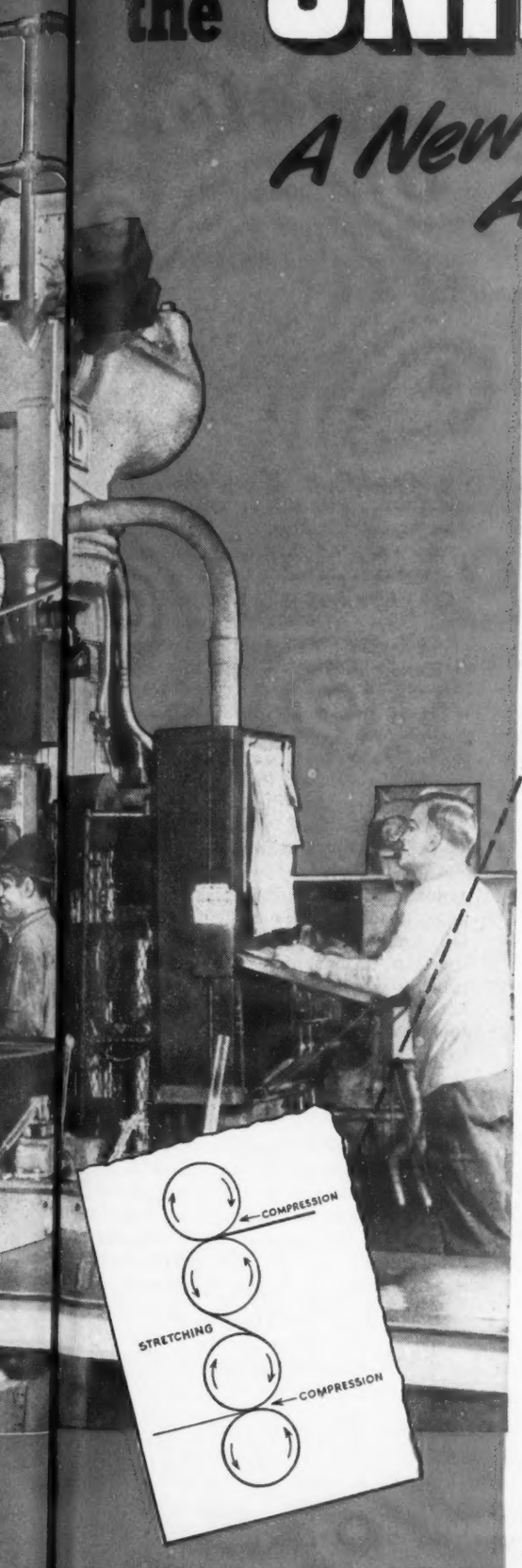


Above—Delivery Side of United Unitemper Mill.

Left—Entry Side of United Unitemper Mill.

the UNITEMPER MILL*

A New Mill... A New Process... A New Product



★ **Simplest Mill Arrangement to Produce All Commercial Degrees of Temper Hardness**

★ **Permits Standardization of Ingot Analysis**

★ **Produces a Flatter Strip with Better Cold Forming Properties**

★ **Produces at Lower Costs**

This mill resembles somewhat in appearance a conventional 4-high mill. It employs in a single housing two pair of processing roller and tensioning units disposed vertically with respect to one another and between which the strip is processed by stretching, the strip passing in a circuitous path around these units. This stretching is accomplished by regulation of the differential in speed between the upper and lower roller tension units. In the mill the strip is reduced continuously in a sequence of operations consisting of rolling, stretching, and again rolling, the major portion of the reduction being accomplished by stretching and the processing being varied as required to secure different degrees of hardness.

UNITED UNITEMPER MILL utilizes the principle of **work-hardening or tempering by continuous stretching.** The resultant product, uniformly cold-worked throughout its entire thickness, conclusively shows superior cold-forming properties as well as meeting all accepted physical standards.

All commercial degrees of hardness can be made with one pass through the UNITEMPER MILL, using one grade of rimming steel. Standardization of ingot analysis, with its attendant economies, is therefore possible.

The UNITEMPER process, which embodies all of the essentials of continuous stretcher leveling, produces an **extremely flat product.**

Extremely low rolling pressures, as compared with conventional 4-High Temper Mills, permit use of UNITED Alloy Iron Rolls instead of more expensive forged steel rolls. This, plus savings resulting from **standardization of ingot analysis,** and savings due to a **simpler installation,** make the UNITEMPER process extremely attractive from a manufacturing standpoint.

To manufacturers of tinplate, autobody sheets, furniture stock, stainless steel panels and other specialties, in anticipation of demands for hard-rolled steel with better cold-forming properties for many fabrications, the revolutionary advantages of UNITEMPER will be apparent.

UNITED engineers will gladly furnish complete information including data based on mill production records.

** Process and apparatus patents pending.*

UNITED ENGINEERING AND FOUNDRY CO.

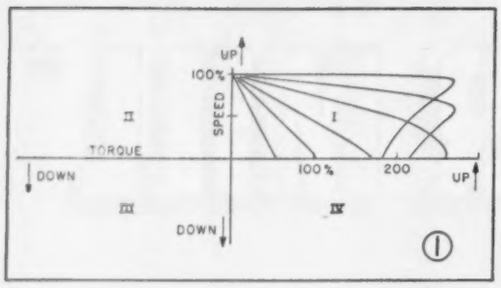
PITTSBURGH, PENNSYLVANIA

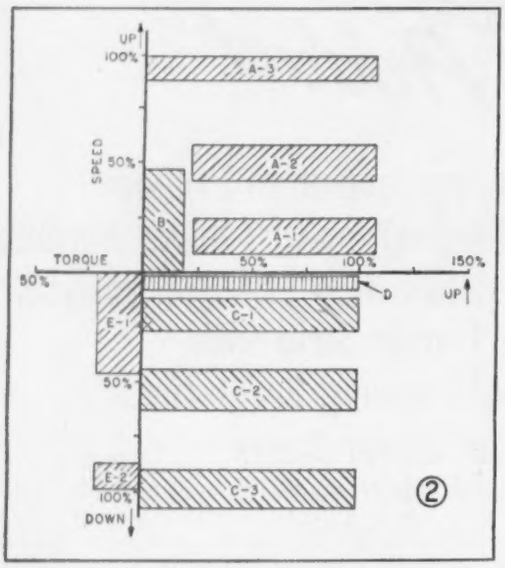
Plants at PITTSBURGH · VANDERGRIFT · NEW CASTLE · YOUNGSTOWN · CANTON

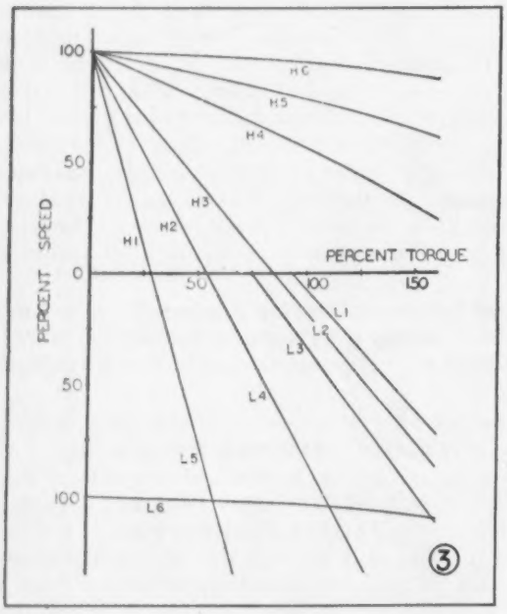
Davy and United Engineering Company, Ltd., Sheffield, England

Dominion Engineering Works, Ltd., Montreal, P. Q. Canada

** The World's Largest Designers and Makers of Rolls and Rolling Mill Equipment*







Alternating current control systems for OVERHEAD CRANES

Because of the almost universal usage of alternating current, this discussion presented before the Westinghouse Materials Handling Machinery Manufacturers conference will be helpful in selecting controls and drives

By C. B. RISLER

Industry Engineering Department
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

THERE are four general systems in use for controlling crane hoists which are powered with wound rotor alternating current motors. Since use of alternating current for this purpose is increasing, a study of these four systems and what each will do is in order. Systems are usually known as (1) counter torque, (2) DC dynamic braking (3) adjustable unbalanced voltage, and (4) variable unbalanced voltage or reactor.

Speed-torque curves provide a convenient basis for description of the performance of the various systems. In Fig. 1, which shows the conventional speed-torque curves for a wound rotor motor, it indicates that primary interest in hoist work occurs where there is positive or negative torque in a downward direction, or positive torque in an upward direction. Thus all action can be plotted in quadrants I, III, or IV.

There are six desirable performance characteristics, outlined as follows:

1—Hoist all normal loads at slow, medium and high speeds.

2—Hoist light loads at reduced speeds.

3—Lower all loads at slow, medium and high speeds.

4—Provide a creeping lowering speed throughout the normal range of load for careful spotting of critical loads.

5—Lowering nonoverhauling empty hook at both high speed and low speed.

6—Throughout all operations keep motor current as low as possible to reduce motor heating.

The graph of hoist characteristics of the various control systems shown in Fig. 1 shows them to be practically identical. These characteristics are secured by adjusting the rotor external resistance, and provide excellent regulation at full speed and a good selection of speed points for loads of medium weights and heavier. The weakness is in the light load sector, where slow speeds are difficult to obtain.

In the lowering direction, full speed actually is obtained when the load overhauls the motor, and rotates it at a speed above synchronous, which means the motor becomes a generator and pumps power back into the system. Maximum safe speed is 150 per cent of synchronous speed, or a maximum of about 125 per cent for practical purposes, and this does not give operator control of load at such speeds. These characteristics are common to all AC systems.

Counter Torque System

The counter torque system uses standard wound rotor control elements: Reversing contactors in the stator leads, external resistance in the rotor circuit, and contactors to control the amount of external resistance inserted. In lowering by this system, the motor exerts upward effort on all positions except the

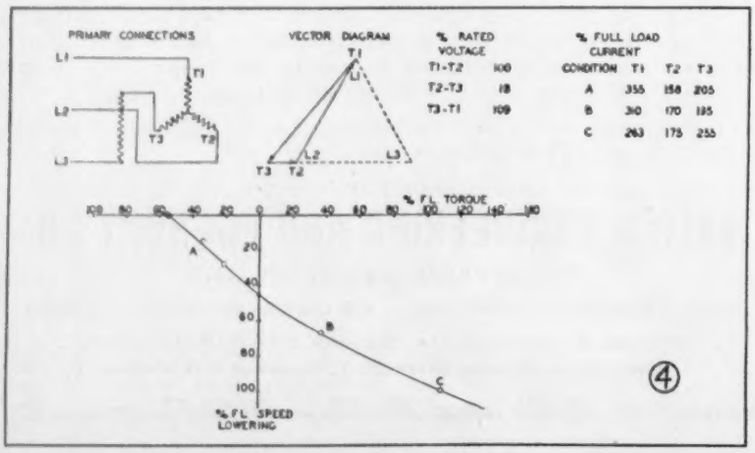


Fig. 1—Speed-torque axes with quadrants identified and hoisting curves for hoist type wound rotor motor

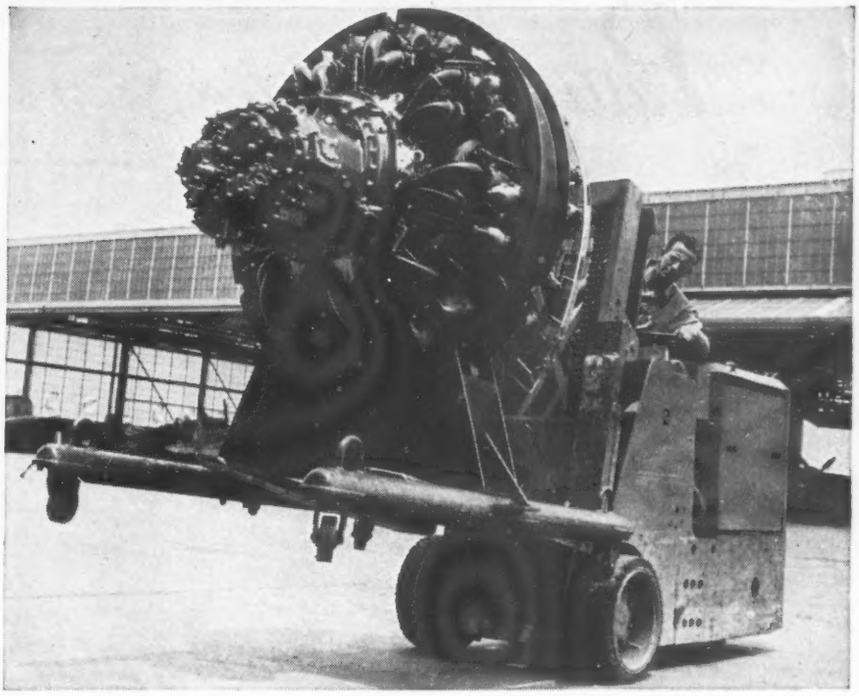
Fig. 2—Speed torque plot of desirable performance characteristics of a successful crane hoist control

Fig. 3—Speed-torque curves for wound rotor motor using counter torque system

Fig. 4—Test results with hoist type wound rotor motor using an adjustable unbalance voltage connection

DELIVERS THE GOODS . . .

ANY TIME ANY PLACE

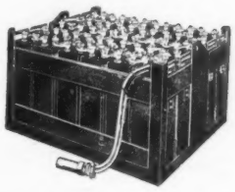


Keeping plenty of planes flying "over there" calls for round-the-clock production of them over here . . . means speeding thousands of parts and sub-assemblies from one operation to another with time-table regularity. Keeping production lines adequately supplied continuously throughout every shift is a stop-and-go job in which battery industrial trucks excel because of their inherent advantages.

They can go almost anywhere . . . indoors or outside . . . because they are quiet and free from fumes. They can even be provided with spark-enclosed construction for operation where fumes and fire hazards may exist.

Exchange batteries keep the truck continuously supplied with power. While one battery operates the truck, another is being charged. The truck starts instantly, accelerates smoothly and consumes no power during stops. Thus it makes efficient use of power, and the current used for battery charging is the lowest-cost power available.

Its electric motor drives are inherently simple and trouble-free. No other type of truck has so few wearing parts. In fact, the battery industrial truck is one of the most dependable and economical types of handling equipment . . . especially when powered with Edison Alkaline Batteries. With steel cell construction, a solution that is a preservative of steel and a fool-proof electrochemical principle of operation, they are the most durable, longest lived and most trouble-free of all batteries. *Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, New Jersey.*



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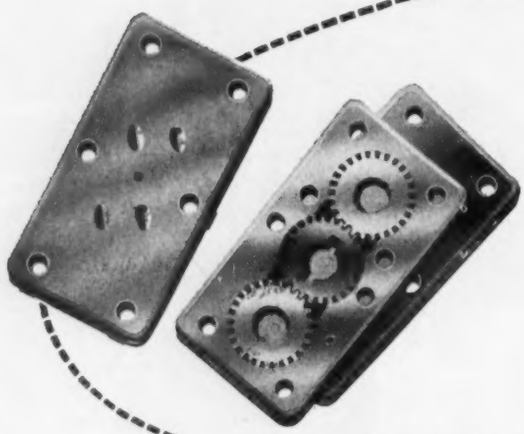
ALKALINE BATTERIES

In Industrial Trucks, Alkaline Batteries Give You These Important Advantages

- They are durable mechanically; grids, containers and other structural parts of the cells are of steel; the alkaline electrolyte is a preservative of steel.
- They can be charged rapidly; gassing cannot dislodge the active materials.
- They withstand temperature extremes; are free from freezing hazard; are easily ventilated for rapid cooling.
- They are foolproof electrically; are not injured by short circuiting, reverse charging or similar accidents; are free from self-deteriorating reactions.
- They can stand idle indefinitely without injury, without attention, and without expense.
- They are simple and easy to maintain.

ANOTHER MASS-PRECISION ASSEMBLY BUILT BY NICHOLS

Putting the "No Ice" Sign



on an Airplane's Propeller

A propeller blade is certainly no place for an ice-pack. Neither is a pilot's windshield. Yet every drop of freezing rain that strikes these surfaces is potentially ice-forming... and dangerous.

W. H. Nichols & Sons has helped combat this natural "enemy" by producing a unique precision pump for an anti-icing unit which "beats ice to the draw" by spreading a thin film of alcohol on these exposed surfaces. The mixture of alcohol and rain with its lower freezing point quickly flies off as harmless vapor instead of turning to ice.

Metering such a thin fluid as alcohol with *exact, measured* distribution to both engines in a bi-motored plane presents many unusual manufacturing requirements. The pump must operate *completely without lubricant* to insulate the rubbing surfaces from one another. This means fine, flat surface finishes and strictest dimensional accuracy. Since the whole unit is powered by the plane's limited electrical supply, complete freedom from binding is essential.

Nichols mass-produced the close dimensions required...gears thicknessed to plus 0" minus .0001"...side plates flat to .0002" over 3½" length...bores in the centerplate held to plus .0002" minus 0". A high production rate was constantly maintained *without pre-selection of any parts* and the cost kept low.

Such performance is typical of Nichols' forty years of mass-precision manufacturing ability. Here unique facilities have been developed for producing the "hard" parts.

Perhaps you have an unusual precision problem—part or assembly—which can benefit from such a tradition of accuracy in mass-production. Talk it over with "Accurate" Nichols.

W. H. NICHOLS & SONS, WALTHAM 54, MASS.

"Accurate" *Nichols*

PRECISION ENGINEERING AND MANUFACTURING FACILITIES FOR MASS PRODUCTION

last, and thus the weight of the load exerts the only downward force, the motor acting as a counter-force with the extent of its force determined by the amount of resistance plugged into the secondary of the motor. In Fig. 3, this performance is shown by the extension of the speed-torque curves into quadrant IV, curves L1 to L5.

Under these conditions, it is obvious that lowering control will be quite poor, particularly under changing load conditions. Furthermore, it is quite difficult to hoist light loads at slow speeds, and even more difficult to lower such loads at low speeds. There is no creeping or inching point for such loads in the lowering direction. The best performance in this system is obtained in lowering operations on loads between 50 and 100 per cent torque, with a wide range of positions available for such jobs.

While these characteristics do not make for ideal conditions in applications where the loads are apt to vary, as in general hook work, the drive is particularly well suited for such jobs as grab bucket hoisting, where a more or less narrow range of loads exist and slow and accurate landing and taking off are not required. In such applications, the counter torque system is the simplest and most efficient installation.

DC Dynamic Braking

When a direct current is circulated through the stator windings of a wound rotor motor a stationary field is set up across the air gap. When the rotor is turned in this field, voltages are generated in the rotor windings, causing circulation of current through the motor and its external resistance. The energy causing rotation is thus dissipated as heat from the external resistance of the rotor circuit. Such a system of securing retarding torque is used in conjunction with regenerative operation previously described to secure a set of lowering characteristic curves. For normal hoist applications a maximum retarding torque of 150 per cent is ample. This can be secured by circulating approximately 133 per cent direct current through the stator of the wound rotor motor. This value of current does not excessively heat the motor since it is only carried through two of three windings of a Y connected motor or distributed through three windings of a Delta machine.

The speed torque characteristics resulting from such a system of retardation are shown in Fig. 5. It is seen that this system offers much flatter curves than those available with the counter torque system inasmuch as the first five lowering curves converge at 0 speed. Furthermore, over the range between 25 per cent and 100 per cent load, a good selection of operating speeds is available. The characteristic present in the counter torque drive which caused some loads to be hoisted inadvertently is completely eliminated. Adjustment of the rotor resistance can vary the location of the curves and where an accurate creeping speed is desired one can be readily obtained which will give a maximum of 5 per cent speed with 100 per cent torque. The curve for such a drive is shown as a dotted line. This drive, like the counter torque, lacks ability to "power drive" a light hook down at predetermined slow speed and similarly is weak in providing a wide range of operating speeds in extremely low torque region.

Heating of motor caused by the circulation of excitation current in stator and generated current in rotor is about equal to that required for the same torque and speed in the hoisting direction.

The result is a drive which, for applications where an overhauling load is assured, provides a fine degree of control with smooth transition from one running speed to another and a very definite control of creeping speed regardless of load. Applications have been made to gantry type shipyard cranes, overhead traveling cranes, and for the emergency braking of a car dumper cradle for lowering cars from which the frozen ore cannot be dumped. Further applications of this system have been made on mine hoists, conveyors, and other machine drives where retarding torque was needed.

Recent trends in the development of AC crane hoist control have been to apply unbalanced primary voltages to the terminals of the wound rotor motor. What, until now has been generally regarded as an unfavorable operating condition, has been found to provide desirable characteristics particularly in lowering operations. One scheme employs

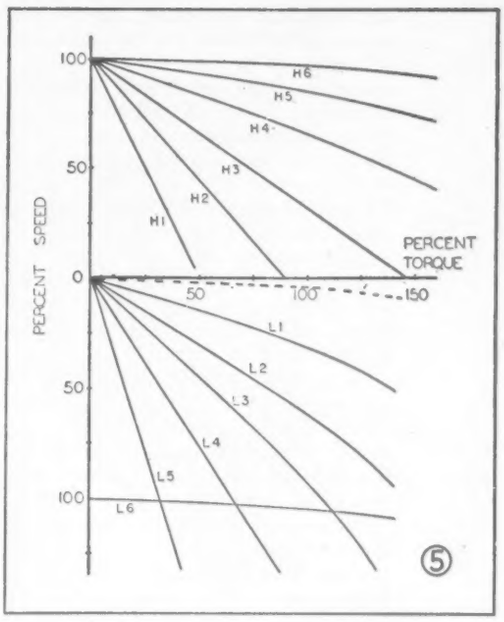


Fig. 5—Speed-torque curves for wound rotor motor using DC dynamic braking system of control

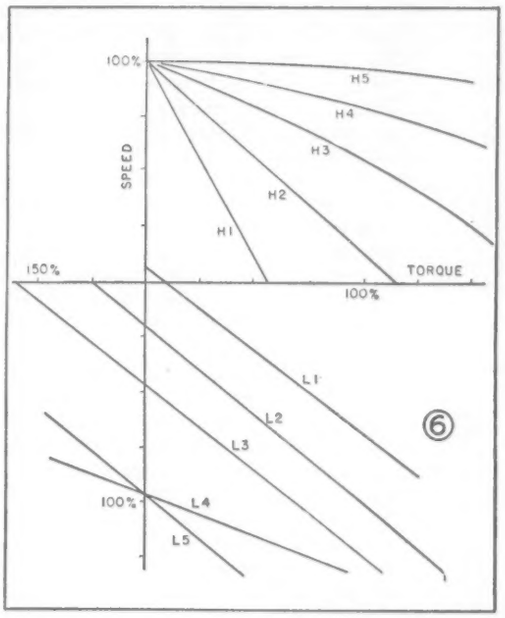


Fig. 6—Speed-torque curves for wound rotor motor using an adjustable unbalanced voltage scheme of control

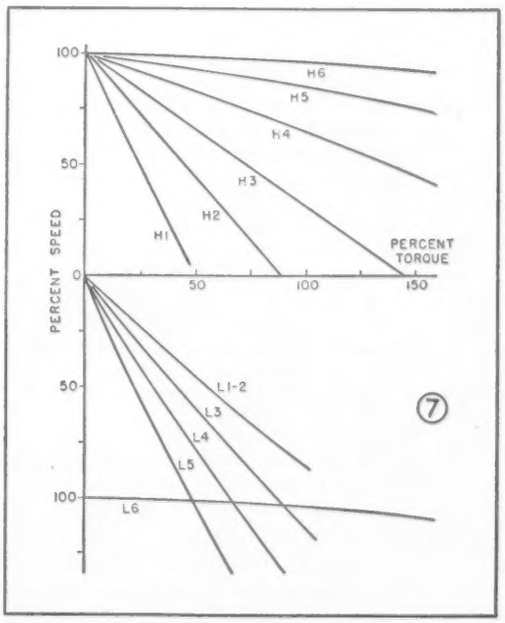
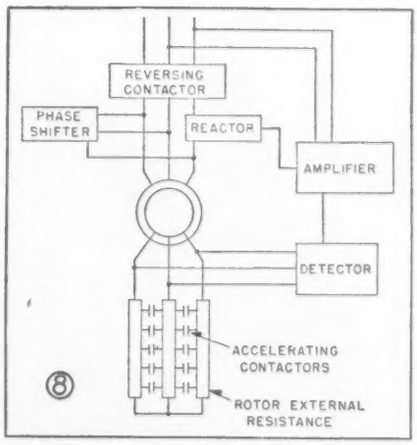


Fig. 7—Speed-torque curves for wound rotor motor using AC dynamic braking system of control

Fig. 8—Schematic diagram with functional features of equipment used in a variable unbalanced voltage system of control for hoist type wound rotor motor



an adjustable unbalance, changing the degree of unbalance for the various control steps to get the various speeds of operation. The unbalanced voltages are secured by the use of an auto-transformer with a multiplicity of terminals. Fig. 4 shows the basic stator connection for such a control. Reversing terminals T1 and T3 on the auto-transformer taps will result in a reversal of the phase sequence of the voltages applied to the motor terminal and hence, by reversing the direction of the primary rotating field, will reverse the torque exerted by the motor.

With this adjustable unbalanced voltage system, speed torque characteristics are obtained as shown in Fig. 6. These give a good selection of speeds between 0 and 50 per cent load. Above 50 per cent load the drive lacks control at slow speeds. The drive offers excellent characteristics for driving a nonoverhauling light hook at slow, medium and high speeds. The slope of the speed torque curves (an indication of the regulation) is about equal to the average obtainable with the DC dynamic braking scheme. However, the regulation is not as good in the slow speed regions. This, therefore, results in the lack of creeping speed for the careful spotting of all loads.

The use of a constant value of applied voltage for each of the operating points throughout the entire speed range results in extremely high current shown in Fig. 4. This figure presents the result of tests conducted with stator connections shown at the left. The unbalanced voltages applied to the motor are shown by the vector diagram and the tabulation of per cent rated voltage between the various motor terminals. The value of the rotor resistance and applied unbalanced voltages has been chosen to give a speed torque curve crossing the zero torque axis at approximately 50 per cent and having 100 per cent speed at approximately 100 per cent torque. Such a curve is one which would find frequent use where such a system of control would be applied to a hoist, although the slope of the curve might be made somewhat steeper in order to limit the motor currents. The currents drawn at the three motor terminals are shown in the tabulation in the corner of this figure. Particular attention should be given the points B and C which are in the zone of lowering operations. It is noted that the current in each line is well above its rated value, ranging between a maximum of 300 per cent and a minimum of 170 per cent. Operation for long periods of time or at frequent intervals under such conditions will result in excessive motor heating. As slower operating speeds are desired,

Fig. 10—Tabulation of hoisting features provided by the five systems of control, namely; counter torque, DC dynamic braking, adjustable unbalanced voltage, AC dynamic braking and variable unbalanced voltage

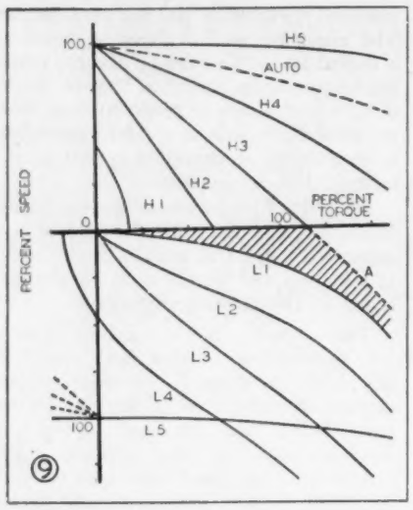


Fig. 9—Speed-torque curve for wound rotor motor using variable unbalanced voltage or "reactor" type of control

greater unbalance in voltage must be applied and the currents for a given torque increased.

The result is a hoist control which meets certain requirements in the lowering direction which have not previously been met, particularly by supplying operating points in the moderate and slow speed regions for loads up to half the motor rating. It further meets the requirements of lowering a nonoverhauling light hook in a very fine manner. However, loads of 75 per cent and larger cannot be lowered at less than 50 per cent speed. This requires high current which necessitates some care in motor and control selection where the drive is to be used frequently. The drive requires the opening of at least one of the main power leads to the motor between each of the control points in the lowering direction.

A scheme of control frequently referred to as AC dynamic braking has been marketed to some extent. This is a special case of the adjustable unbalanced voltage drive in which the value of unbalance is chosen such that the voltage between two motor terminals is zero. The two motor terminals are tied together and a single phase AC voltage is applied. The speed torque characteristics of such a drive are shown in Fig. 7. Various speed torque characteristics are obtained by varying the rotor resistance rather than by changing the voltage applied to the motor terminals. There is an optimum value of rotor resistance giving the best regulation (Curve 1-2) and this cannot be improved upon. Result is that rated loads cannot be lowered at speeds lower than 60 per cent. With this connection currents as high as 225 per cent are drawn at full load.

This variation of the application of unbalanced voltage results in a drive which has limited use. It was originated in Germany by the Siemens-Schuckert Co. and has been used by them in conjunction with the counter torque and regenerative systems. Its chief value in American practice has been as a retarding point to reduce the service required on brakes when it is automatically inserted between a running point and the "off" or "stop" position.

Instead of applying an adjustable unbalanced primary voltage, a system of control has been devised whereby the degree of unbalance applied to the motor terminals is varied as a function of the motor speed. The relationship between this unbalance and the motor

(*Please turn to Page* 126)

FEATURE	TYPE OF DRIVE: COUNTER TORQUE	D.C. DYNAMIC	ADJUSTABLE UNBALANCED VOLTAGE	A.C. DYNAMIC	VARIABLE UNBALANCED VOLTAGE
HOIST NORMAL LOADS AT SLOW SPEED, MED. SPEED, HIGH SPEED	Δ	Δ	Δ	Δ	Δ
HOIST LIGHT LOADS AT SLOW SPEED					Δ
LOWER NORMAL LOADS AT SLOW SPEED	⑧	Δ			Δ
LOWER NORMAL LOADS AT MED. SPEED	⑧	Δ	Δ	Δ	Δ
LOWER NORMAL LOADS AT HIGH SPEED	Δ	Δ	Δ	Δ	Δ
LOWER ALL NORMAL LOADS AT CREEPING SPEED		Δ			Δ
LOWER NON-OVERHAULING LIGHT HOOK AT SLOW SPEED					⑩
LOWER NON-OVERHAULING LIGHT HOOK AT HIGH SPEED	Δ	Δ	Δ	Δ	Δ

⑧-OBTAINABLE WHEN LOADS CAN BE PREDETERMINED.

It Begins with the Iron in Toncan Iron

...and produces the Highest Rust-Resistance of any Ferrous Material in its Price Class

Fe, the symbol for Iron, is the beginning of a proved formula for longer sheet metal life. And it is the first of many reasons why Toncan Iron has the highest rust-resistance of all ferrous materials in its price class.

Toncan Iron is made from an open-hearth iron that is refined to an exceptionally high degree of purity. Thus, chemical impurities and non-uniform grain structure, which invite corrosion, have been reduced to a minimum.

Besides that, Toncan Iron is an alloy. To the refined open-hearth iron is added twice as much copper as found in copper-bearing steel. It also contains molybdenum—added to make the copper more effective.

You'll like Toncan Iron, too, because its rust-resistance is uniform—all through the metal. And because Toncan Iron *is* a refined iron and carefully processed for ductility, it is one of the easiest materials to fabricate by all methods.

So, whenever your requirements call for a material of high rust-resistance, remember the longer service and lower fabricating costs of Toncan Copper Molybdenum Iron.

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Republic

TONCAN COPPER MOLYBDENUM **IRON**

—for these parts of your product and for those sheet metal applications in your plant where low-cost resistance to rust is needed.

INDUSTRIAL EQUIPMENT

Electric Welder

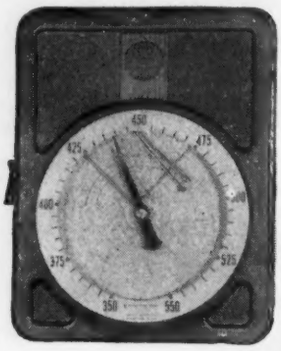
Designated as No. G-225, a new electric welder is announced by Hampton Electric Mfg. Co., New Kensington, Pa. The unit operates on 220 volt or 440 volt

supply and has a capacity of 30 to 300 amperes. It is capable of handling electrodes from 1/16 to ¼ inch diameter. The welder has a stabilizer designed to counterbalance the welding current and voltage. It is equipped with a thermostatically controlled arcless overload cutout to protect it against excessive overloads. The unit also has a number of welding heats between minimum and maximum in increments of ½ ampere if desired.

Electronic Controller

An electronic type resistance thermometer suitable for indicating, recording and controlling temperatures between 100 and 1000 degrees Fahr. is announced by Bailey Meter Co., 1050 Ivanhoe road, Cleveland 10. This recorder operates on the null balance principle and provides instantaneous balancing action by electronic detection and control. Unbalance of the measuring bridge is detected by electron tubes without the aid of a galvanometer or other moving parts.

An indicating scale which circles the chart may be read easily at a distance of 50 feet, the pointer reading coinciding with that of the recording pen. Indicating, recording and controlling mechanisms are all driven by the same reversible electric motor which adjusts the slidewire resistance to balance the measuring bridge. This motor is continuously connected to the electronic control unit which is continuously connected to the measuring bridge. The temperature sensitive element is a platinum resistance wire, wound on a mica form and held between two mica sheets which are clamped by a metal frame. The element is further protected by a well which is

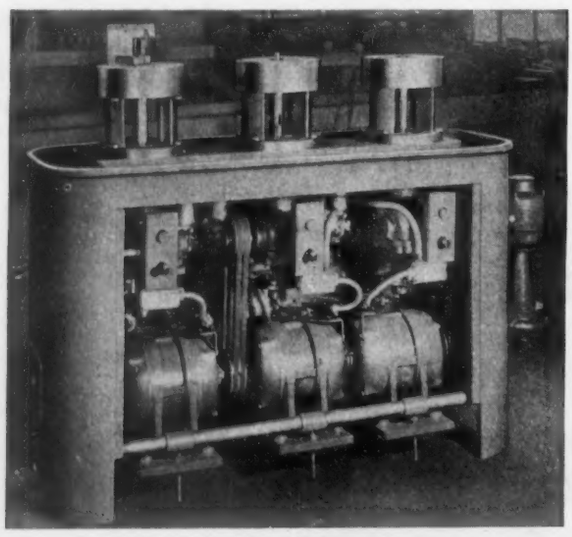


permanently installed in the pipe line, furnace wall, duct, or other point of temperature measurement. As alternating current is used for the bridge, no battery source of bridge voltage is needed. Standard voltage cells and voltage standardization equipment are not required.

Tapping Machine

The new three spindle automatic tapping machine introduced by D. H. Prutton Machinery & Tool Co., 5295 West 130th street, Cleveland 11, can tap three different size holes up to 1-inch simultaneously. One, two or three different sizes of work can be handled at the same time. Three separate motors with separate controls are provided.

A single or continuous cycle is available. Pressing one of the buttons causes the spindle to travel all the way to the top and reverse. Pressing, the same button and turning it causes the cycle to be repeated again and again. This tapping machine employs the lead screw principle. The master nut has a safety feature which prevents excessive vertical pressure on the tap. A keyway located on inside wall of the lead screw fits a key in the spindle. A worm-and-worm gear rotates in the spindle. Positive feed by the lead screw prevents any tearing of threads. The total lead is held within a tolerance of 0.0005-inch. A hole up to 1½ inches in length can be tapped with a range in pitch up to 8.

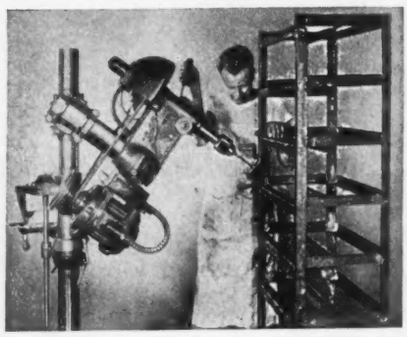


Each unit has its own individual control, being actuated by a start-stop push button. If a part jams on the upstroke, the operator pushes the red button to stop the motor. By pulling out the black button, the machine reverses to the neutral position. The three fixtures can be located on the table to face the operator convergingly.

There are two tanks of 5-gallon capacity each, located in each leg. One is for the coolant, the other for hydraulic oil in case hydraulic holding is desired. The flow of the coolant is shut off when the tap has completed the down stroke, thereby gushing of oil is avoided while loading and unloading the fixture.

Angle Bracket

To convert a drill press into an all purpose machine for angle drilling, polishing, buffing, sanding, rotary filing, wire brushing, tapping, reaming, burring, grinding, horning and varied uses, Nobur Mfg. Co., 910 North Orange drive, Los Angeles, has developed a new angle



bracket. Spindle angles can be adjusted to any height, placed horizontally or vertically, at any angle. It fits the machine to the work.

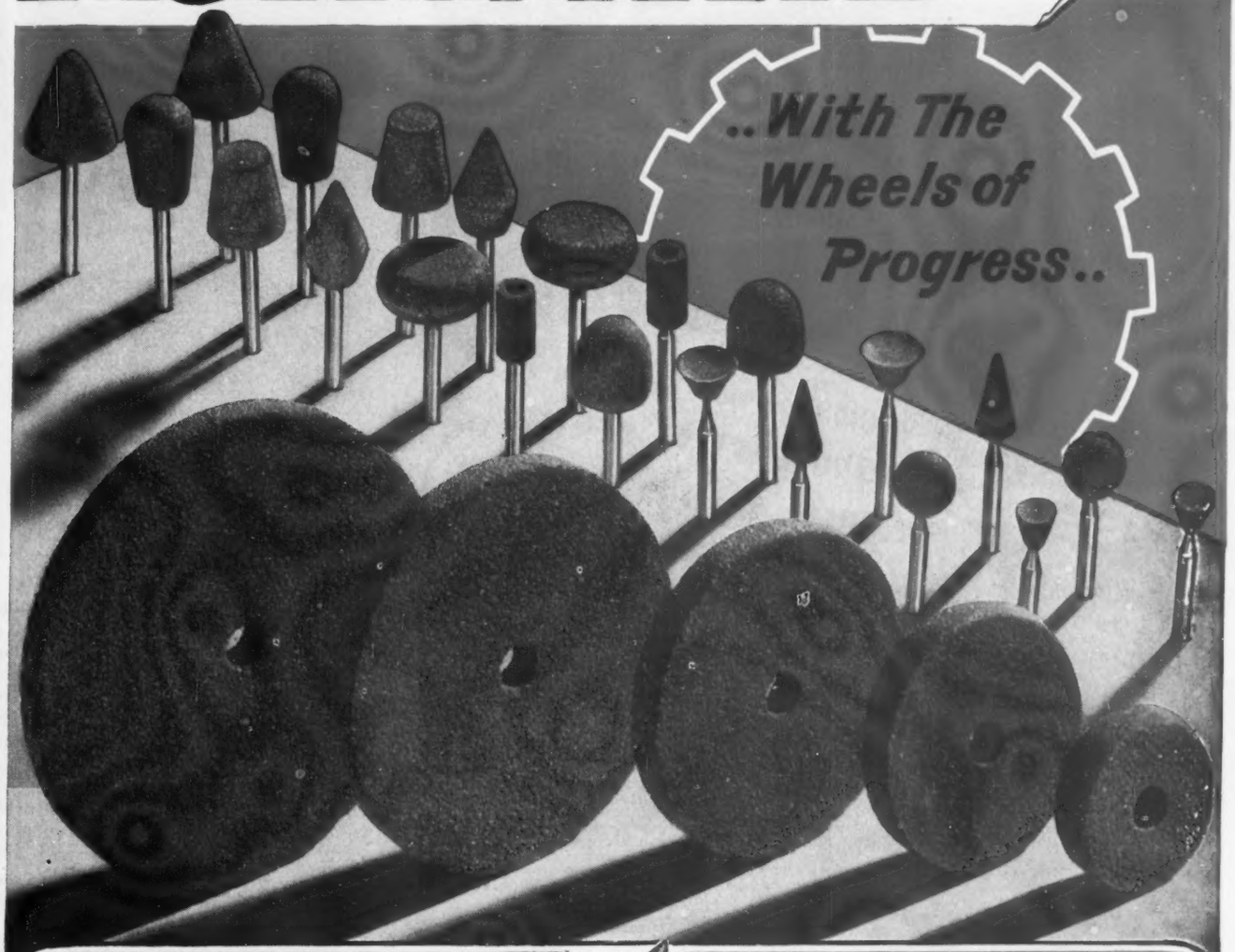
This bracket is available for all popular models of drill presses with construction embodying round tubular column. A turn of the wrench is needed for positioning. Available in sizes for drill press with 2¾ to 3 29/32-inch tubular columns.

Multi-Rectifier

The new multi-rectifier introduced by Green Electric Laboratories, 130 Cedar street, New York 6, allows for a range from zero to 48 volts in a compact mechanism. It incorporates six selenium rectifier sections which may be interconnected by external links to provide four ranges of direct current power: 0 to 8 volts, maximum capacity 100 amperes; 0 to 16 volts, maximum capacity 50 amperes; 0 to 24 volts, maximum capacity 35 amperes; 0 to 48 volts, maximum capacity 18 amperes. Therefore, it is possible for the two panel-mounted

(All claims are those of the manufacturer of the equipment being described.)

FORWARD



CHICAGO GRINDING WHEELS AND MOUNTED WHEELS

● Geared to the precision demands of war, Chicago Wheels have been a potent force in smashing bottlenecks —cutting down rejects—speeding production to an all-time high.

Constantly tested, constantly improved—Chicago Wheels produce finishes so perfect they pass exacting surface analyzer tests, so accurate they can be measured in micro inches.

Production of civilian goods will demand the same precision finishing methods.

Keep pace with Chicagos, the Wheels of Progress!

CHICAGO GRINDING WHEELS

Anything up to 3" in diameter in various grains and bonds, including FV, the sensational new bond with a pedigree.

CHICAGO MOUNTED WHEELS

Shapes and abrasive formulas to take care of every job of internal or external finishing.

TRY ONE FREE!

So you'll know what they can do, we will send a test wheel. Tell us material you'd like to finish and size wheel required.

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Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Abrasive Industry

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Send Catalog. Interested in ☐ Grinding Wheels ☐ Mounted Wheels. ☐ Send Test Wheel. Size.....

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Address.....

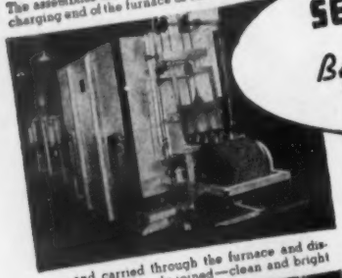
EF FURNACES

For Every Industrial Heat Treating Process

you can join your metal parts ECONOMICALLY, NEATLY, SECURELY and CONTINUOUSLY

By the ELECTRIC FURNACE BRAZING METHOD

The assemblies are loaded on a conveyor at charging end of the furnace as shown below



. . and carried through the furnace and discharged—securely joined—clean and bright

Aluminum, steel, brass and other assemblies are being securely and economically joined in EF brazing furnaces.

Products which otherwise would be difficult or expensive to make in one piece are being made in several pieces and brazed.

Products requiring several stampings joined or requiring screw machine parts, forgings and stampings to complete the unit, are being neatly, and economically joined, right in the production line.

Strong, leak-proof joints are made and the completed units are discharged from these furnaces—clean and bright. Any number of joints in the same product or any number of pieces can be joined at one time.

Investigate This Process for Joining Your Aluminum, Brass, Copper or Steel Parts.

We will be glad to put samples of your products through one of our furnaces to show you the results you can expect, and give you an estimate on the cost of the equipment to handle your product.

Send for printed matter showing various types of EF brazing furnaces.

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces—For Any Process, Product or Production

FURNACES OIL, GAS or ELECTRIC

For Every Heating and Heat Treating Process

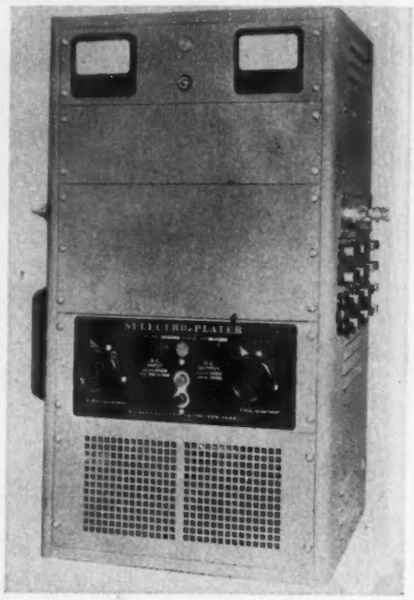
Aluminum Brazing	Carburizing	Nitriding
Annealing	Drawing	Normalizing
Billet Heating	Enameling	Soaking Pits
Bright Annealing	Forging	Scale-Free Hardening
Bright Hardening	Hardening	Quenching Machines
Copper Brazing	Malleablizing	Ceramic Kilns, etc.
Controlled Atmosphere	Silver Soldering	Process Heating

We Build the Furnace to Fit Your Job

THE ELECTRIC FURNACE CO.

SALEM, OHIO

voltage control switches to provide a range of control in 49 steps, from zero to maximum, on any range. The built-in voltmeter and ammeter indicate the direct current output voltage and current at all times and red line calibrations



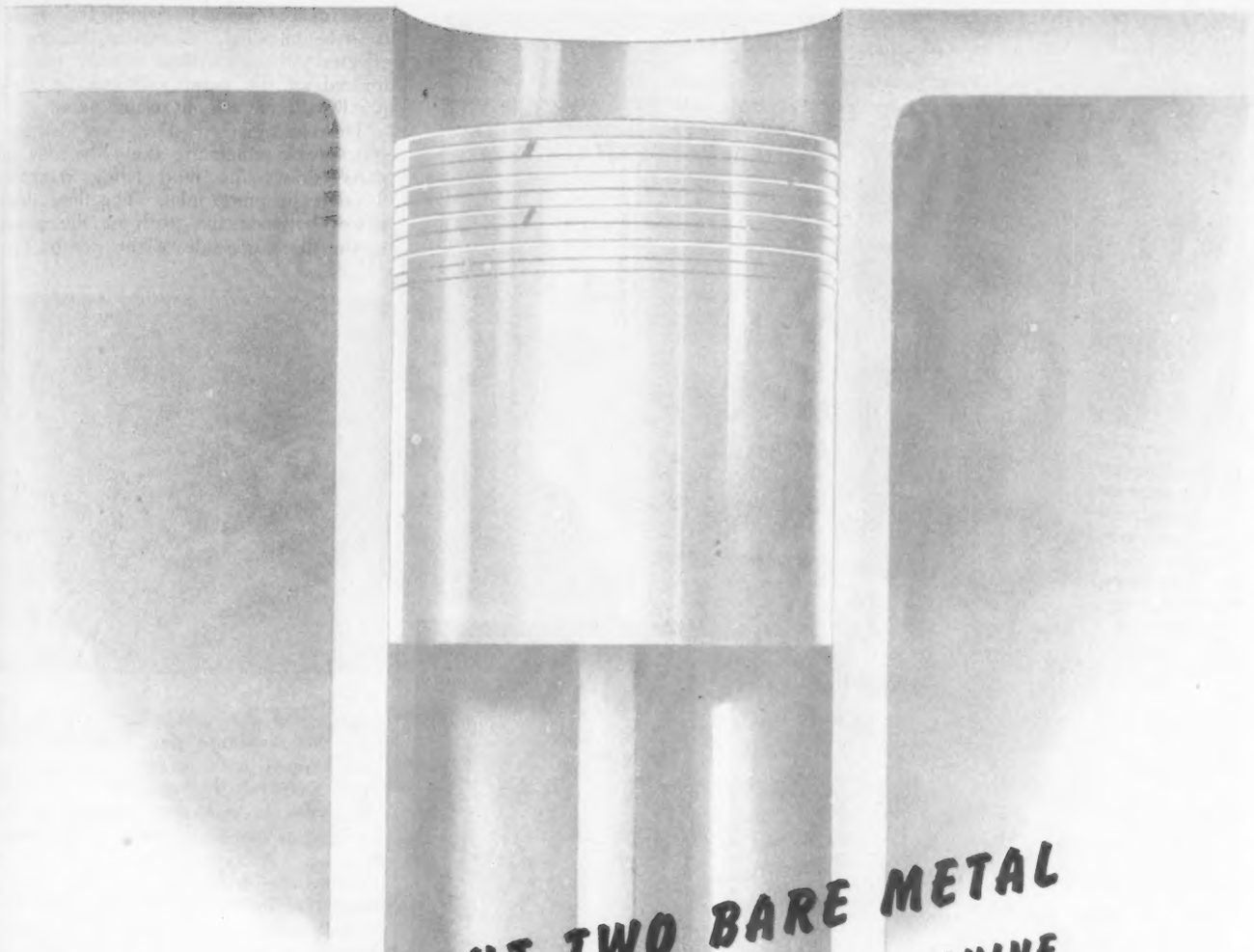
indicate the maximum current limitation on each range.

On each side of the cabinet, wing nut terminals are duplicated for convenience in connecting loads. The section binding posts for interconnection are externally located on the right hand side only. Other additional features include a three phase magnetic contactor in the main power supply circuit with on-off push buttons, pilot lamp, monitor lamp, buzzer for overload warning and automatic watchman which provides automatic current interruption in case of prolonged overload. The multi-rectifier is available for operation from 220 to 440 volts or as specified at 60 cycles.

Rotary Pump

A new low pressure rotary pump designed for industrial application is announced by John S. Barnes Corp., Rockford, Ill. The pump is adapted for use as a lubricating booster pump for oil lines, a gasoline dispensing pump and for oil pressure systems on automotive, truck or tractor equipment as well as on torque converters. Capacity of the unit ranges proportionately from one gallon per minute at 600 revolutions per minute to four gallons per minute at 2400 revolutions per minute.

One feature of the pump is the spur gear tooth form. Tooth construction of the spur gear eliminates excessive sliding and reduces slippage of the fluid to an absolute minimum; each tooth completely fills the mating space, as the gears mesh and perfect sealing action is effected. Protection against excessive pressure is afforded by a relief valve which is adjusted and set at the factory under operating conditions simulating



NEVER PUT TWO BARE METAL PARTS IN CONTACT IN ANY MACHINE ASSEMBLY WHERE WEAR IS A FACTOR

What is Parco Lubrizing?

Parco Lubrizing is a simple, inexpensive chemical treatment that produces on bearing surfaces of iron and steel, without the use of electric current, a nonmetallic, oil absorbent coating that permits rapid break-in of moving parts without scoring or scuffing and reduces subsequent wear. Hundreds of bearing parts are now Parco Lubrized in production. Send for complete information.

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HANDLING—the Common Denominator of PRODUCTION

LET MEN DIRECT POWER—NOT GENERATE IT!

Handling Materials—most common of all production operations—is the key to better plant, dock and terminal performance. Handling starts with the raw materials, follows on through all phases of production and distribution, never stopping until the finished product is delivered to final destination.

Versatile Towmotor—*the one-man-gang*—provides you with a handling system that assures full benefits from other new and modern machinery. Towmotor capably performs hundreds of important handling operations. Save time, manpower, money—*write today* for the Towmotor DATA FILE . . . it gives you the complete story.

TOWMOTOR
THE ONE-MAN-GANG
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those of the plant in which the pump is to be installed. Complete balance is effected by equalized fluid pressre throughout the pump. It can be supplied with or without relief valve.

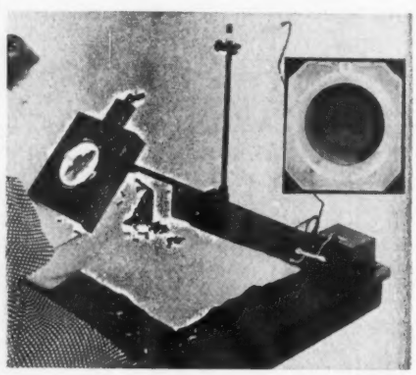
The vacuum created by two identical spur gears, which are the only moving parts, draws the fluid being pumped through the pump inlet. The fluid then passes between the teeth of the gears to the discharge side of the pump. The

meshing of the gear forces the liquid into the discharge line. Driving gear is equipped with a free floating type drive shaft of fine grained steel, with shear pin to minimize damage caused by foreign materials entering the pump housing. A spring loaded oil seal is used on the drive shaft and the shaft is tanged to fit the power drive slot.

Self-priming is a feature of the pump and all moving parts are self-lubricated. The pump is precision machined throughout and socket head screws are used in the assembly. The maximum pressure range on the pump is 200 pounds per square inch.

Inspection Device

Fluorescent tubing of the new cold cathode fluorescent indirect lighted inspection device offered by Larrimore Sales Co., St. Louis, is in circular form around the 5-inch magnifying lens, but



shielded from the lens. It operates on 115 volt, 60 cycles, alternating current, which is converted by a small transformer of 2000 volts. The transformer is in a separate housing which can be fastened near the plug-in.

Billions of $'s in Postwar Prosperity Will Stay Locked Up... Unless We All Help to

Solve Industry's No. 1 Problem

... creating more jobs with high wages by producing *more and better products at a lower cost*

In spite of the pent-up demand created by the past few years of high earnings and restricted purchasing — John Q. Public is going to be mighty cagey when it comes to cashing in his war bonds or depleting his savings account.

The great amount of publicity given to the development of new products has sold future buyers on the fact that American industry and genius will soon deliver better, new products at a lower cost. And, having done without this long, John Q. Public is going to "wait and see."

Realizing this fact, leading manufacturers of production and processing equipment are modernizing their designs with every determination of helping to solve this vital No. 1 problem of all industry.

Business leaders know that only through soundly stimulated demand can they create increased production — and provide more jobs with high wages.

Century Motors Help to Reflect Lower Costs

Of course, machine tools and other processing equipment will play an important part in building and maintaining postwar prosperity — but electric motors are production tools, too, because they are a component part of the machines they drive.

Century Motors offer specialized advantages such as — a wide variety of motor types to match the functional characteristics of production operation—unusual freedom from vibration that contributes to closer tolerances in high speed, precision production—motor protection features that mean uninterrupted production in spite of hazardous atmospheres—permanently quiet operation that results in less waste of human energy—and many other specialized features that reflect lower final costs.

Century's Organization Helps, Too

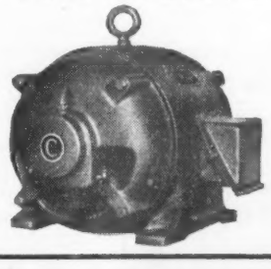
Century's national organization of Motor Specialists has long helped appliance manufacturers and machine tool builders to effect savings in original design and in production output costs. They can help you best when your machines or your products are still in the blueprint or experimental stage.

Everyone Benefits from Century's Performance

Whether you are a manufacturer of consumer products or industrial equipment, a wholesaler or retailer—you, too, have a direct or indirect stake in how well Century Motors can help others in solving the problem of delivering a better product at a lower cost.

Act Now — If you are a manufacturer of Motorized Equipment or Appliances, it will pay you to call your nearest of Century's 31 branch offices.

Century C MOTORS



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CENTURY ELECTRIC COMPANY • 1806 Pine Street, St. Louis 3, Missouri

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PRECOATED
Thomas Strip
COLD ROLLED STRIP STEEL
UNIFORM COATING INSIDE AND OUT
A BASE FOR FURTHER PLATING
BRAZING
WELDING
IMPROVED DIE LIFE
FOR TINNING AND SOLDERING
FOR ULTIMATE FINISH
PRECISION DIMENSIONS
COPPER COATED
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Available in dull or polished finish in coils or cut lengths, Thomas copper coated strip steel is furnished accurately to your specifications.
A CHOICE OF COATINGS
Brass Copper Nickel Zinc Tin
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in colors.
For an all around, economical finish for your product, consult Thomas engineers.
THE THOMAS STEEL CO. • WARREN, OHIO
SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

Shaping Aluminum

(*Continued from Page* 79)

strains which would make the stock brittle.

While engineers admitted, at least theoretically, that a "rubber-formed" part suffered less strain, Ford men did not let that deter them, especially after exhaustive tests proved that the strains set up in the use of steel dies were not so serious as to impair the metal's strength beyond the safety point.

Ford men were more concerned with the problem of warpage. All parts made of aluminum alloy had to be heat treated either before or after forming. Because the heating and subsequent quenching caused the stock to warp, different methods were used to overcome this effect. They tried blanking the smaller parts before heat treating, subsequently rolling the blanks first and then forming them while in the so-called "SW" condition.

Other B-24 parts—chiefly larger parts—were partially formed first, then heat treated. By redrawing the parts to the full depth of the die while the stock was still in the "SW" condition, they were able to complete them to their correct shape with little or no warpage, and with a minimum of strain.

Use of hard dies at Willow Run opened the door to several other important improvements in production methods. Small parts that were being routed or sawed out are now shaped by blanking or by use of punch dies, making possible faster handling, together with a considerable saving of stock.

Piercing Dies Locate Holes

Another advantage has been the punching of rivet holes, as well as tooling and locating holes by means of piercing dies, wherever possible. Formerly, most rivet holes had to be installed by stack drilling the parts, using a drill template to locate them. A separate operation was required for each hole, and there was always the chance that the piece at the bottom of the stack would not be in correct alignment, due to the tendency of the drill to lose its location as it moved through the stock.

Considering the thousands of rivet holes which had to be drilled for each B-24 bomber, this possibility would have created a serious bottleneck in a mass production program.

Ford tool men and production heads decided that greater precision and increased production could be attained by piercing these rivet holes by means of dies. Punches were installed in the blanking dies, wherever feasible, and the piercing operation was combined with the blanking, making a new one unnecessary. As many as 781 individual punches were built into one die to pierce a single row of rivet holes in the flange of an elliptically shaped piece. Standardized piercing dies were developed for this work, piercing holes to within 0.002-inch of template measurement. On flat stock as high as 2160 holes were pierced. Never before in the aircraft industry had such extensive use been

What are you waiting for? The boys that are doing the big job over there, are depending on *you*—over here, to win the peace . . . America's *economic* reconversion is already under way and your business is a vital cog in this national machinery. You *are* America.

Action, gentlemen,

is needed now!

HERE'S HOW YOU CAN HELP . . . (1) Make an immediate analysis of your reasonable needs to begin post-war business. (2) Place unrated orders for this material to be delivered as soon as restrictions permit. (3) Advise your customers to do the same. (4) Keep up to date on W. P. B., and O. P. A. rulings.

HERE'S HOW IT WORKS . . . Unrated orders placed *now* permit your suppliers to anticipate your needs and begin actual production on them as soon as the W.P.B. lifts the bars. This will assure you of a quicker return to civilian business. The orders *your* customers place with you will provide a back-log to start you off when Uncle Sam ceases to be the one big buyer.

With all business following this plan the gap will be shortened—payrolls will be stabilized—returning veterans will find work—America will continue its job of supplying the markets of the world.

HEPPENSTALL, the most dependable name in forgings

Your personal war effort is important (1) Push production (2) Plan for peace (3) Beat 'em with bonds

HEPPENSTALL CO., PITTSBURGH 1, PA.

CHALLENGE
TO YOUR
ENGINEERING
VISION

MORAINE
POROUS METAL
(COMMONLY KNOWN AS POREX)

In Moraine Porous Metal, designers and engineers have an outstanding new material to work with . . . a material that stimulates the imagination with its wide range of applications. Wherever product performance can be improved through filtration, separation, diffusion or flow control of fluids, air or gases, Moraine Porous Metal brings new efficiency to the job.

THESE EXAMPLES SHOULD GIVE YOU A LEAD

Diesel Engines: A small Moraine Porous Metal element, fabricated as a cone and bonded to a metal washer, filters the fuel oil as it enters the injector nozzle—safeguards fine orifices against clogging. *Refrigeration Equipment:* Moraine Porous Metal elements separate oil from the refrigerant, and protect control valves, expansion valves and compressor by removing harmful substances. *Pneumatic Tools:* To safeguard fine orifices in pneumatic tools, Moraine Porous Metal elements filter out harmful dirt. *Lubricated Products of All Types:* Wherever precision parts or polished surfaces must be safeguarded against dirt from lubricating oil, Moraine Porous Metal filters provide effective protection. *Explosion-Resistant Electric Motors:* Where motors must operate in an explosive atmosphere, Moraine Porous Metal vents serve as flame arrestors, permitting the motors to "breathe," yet preventing ignition of the combustible mixture outside them.

BUY AN EXTRA BOND THIS WEEK

MORAINE PRODUCTS Division of GENERAL MOTORS

made of these tools, covering virtually the entire ship.

Likewise a system of locating holes was worked out and standardized, making it possible to exchange dies in the presses without each one being separately spotted. The advantage of this was illustrated by the fact that on the 16 presses of 45-ton capacity, more than 3000 dies could be used interchangeably. Several different sizes could be used on the larger presses because the pattern of holes was extended through a system of "multiple spacing" in die sets.

Use of locating holes extended beyond the press shop. The same holes followed through the assembly fixtures, and parts that had been blanked or formed could be fitted into position later when they arrived at the sub-assembly departments. This made for precision as well as quantity production.

A system of "measured spacing" also made it possible to have the pressure pin holes in the pad match those in the die, when double action was desired, enabling the pressure pins to move freely while the press was in operation. Standardized pressure pads were fitted to press beds, making it unnecessary to lose time through changing springs.

Twenty-five of the larger presses in the press shop are mounted on cast steel sub-bases (approximately 16 feet high) which are set in a concrete pit so that the machines are on the floor level of the shop. This arrangement, developed by Ford engineers from long experience in handling heavy machinery at the Rouge, facilitates setting them up and reduces the cost of moving or re-arranging them.

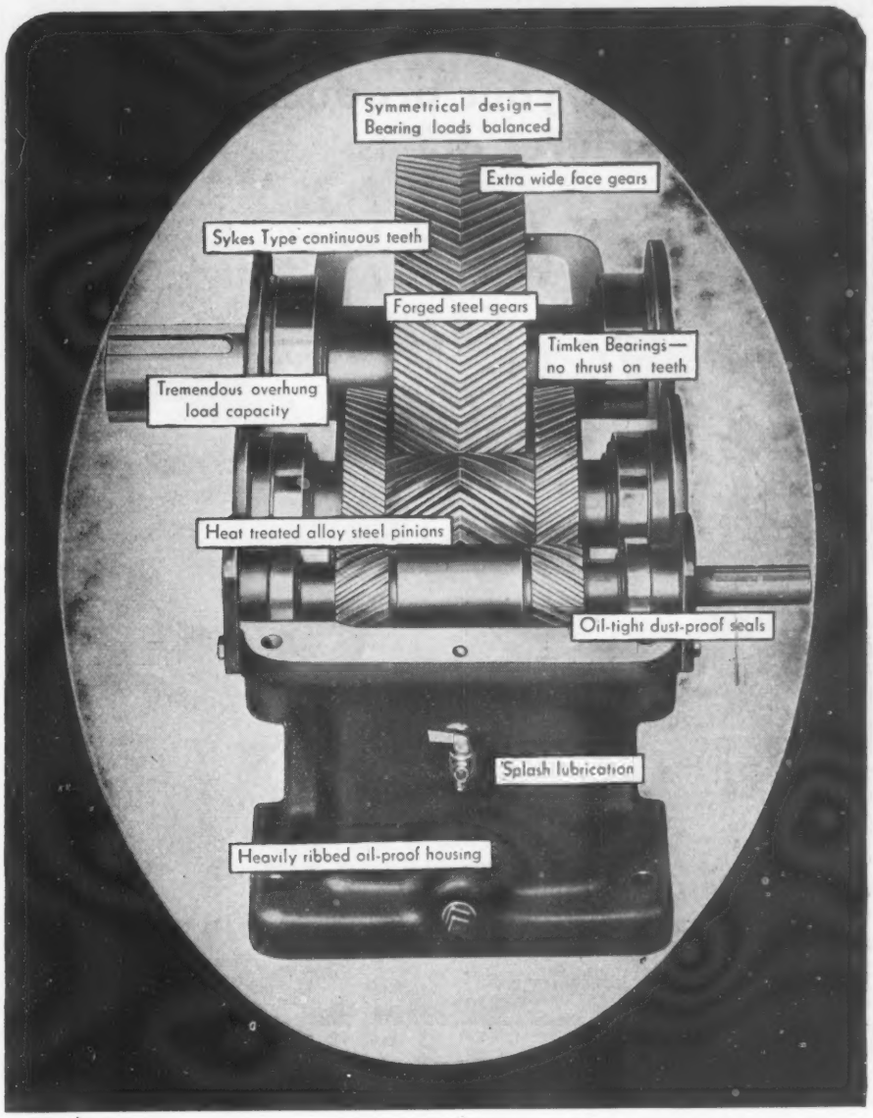
Among the machines are four 1000-ton hydraulic presses especially built to Ford specifications. Each weighs 350 tons; two are triple-action and two are double-action. They are the first streamlined presses of this type to have their hydraulic equipment located beneath the floor, instead of towering high in the air on top of the machine.

This unique design makes for greater ease in moving dies in and out of the press by cranes; but more important, the placing of the equipment in the pit permits servicing the hydraulic units, changing the oil, etc. without interfering with the operation of the press or surrounding machines, and without tying up an overhead crane.

There are 345 presses in all in use at Willow Run alone. Additional parts for the bomber are stamped in other Ford plants. Across the front of the shop along two craneways are 60 heavy presses, ranging from 150 to 1000-ton pressure capacity. Eleven of these are hydraulically operated and the rest are mechanical presses ranging from 30 to 750-ton capacity. About 1550 gallons of oil are used in the large hydraulic presses as a hydraulic agent.

—o—

A 4-page illustrated pamphlet, "The Bodine Motorgram," contains information on uses, characteristics and advantages of the polyphase motor manufactured by Bodine Electric Co., 2250 West Ohio, Chicago 12.



H & S HERRINGBONE SPEED REDUCERS
have 10 points of superiority

★ The features shown in the above illustration of the double reduction Horsburgh & Scott Herringbone Speed Reducer are found also in the single and triple reduction Herringbone units. Extreme accuracy, herringbone tooth design and the locking of gears between oversize Timken roller bearings insure quiet, smooth operation . . . maintenance cost is close to the zero point and depreciation is exceedingly low, even under very heavy shock loads and other difficult conditions of service.

Send note on Company Letterhead for Speed Reducer Catalog 39

THE HORSBURGH & SCOTT CO.
GEARS AND SPEED REDUCERS
5112 HAMILTON AVENUE • CLEVELAND, OHIO, U. S. A.

To protect your product against costly failures due to

WEAR
IMPACT
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CORROSION
• • • use parts of
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Metal
• • • an engineered alloy of closely controlled quality, from the only completely-equipped, self-contained source of aluminum bronze parts.

Nowhere else can you obtain *all* of these benefits, to enhance the salability, performance, and reputation of your product:

1. Distinctive properties of resistance to wear, impact, fatigue, corrosion.
2. A series of engineered alloys—with physical properties to fit your application.
3. Quality control to hold these properties within narrow limits.
4. Diversified production facilities, coordinating in one place all the commonly used metalworking processes.
5. Engineering and production "know-how" to give you a practical manufacturing program.
6. A nation-wide organization of field engineers to assist you.
7. A record of proved performance in hundreds of leading makes of equipment.
8. A national reputation that makes Ampco Metal parts a sales asset.

Send us your prints when you are ready to consider materials. Write for bulletins. *Ampco Metal, Inc., Dept. S-1, Milwaukee, Wisconsin.*

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AMPCO Metal
The Metal without an Equal

A-7B

Two-Million Volt X-Ray Unit

(*Concluded from Page* 95)

of which are much more opaque t. X-ray than others.

Another advantage of the high-voltage rays is that the machine may be placed far back from the specimens and a large area sprayed with X-rays as powerful as those from a lower voltage tube at closer range, which would cover only a very small area. Thus, high-voltage X-rays are advantageous, even with smaller pieces of metal that do not require great penetrating power.

Placing the X-ray tube at a distance from the part being radiographed also increases accuracy of pictures by reducing distortion. Rays spread out from the target like light from a candle. A defect in a casting that is close to the film will appear in its actual size, while one that is considerably nearer to the tube will be enlarged. When the X-ray generator is well back, both will record correctly.

Selective Pole Tripping Improves Fault Correction

A new relay development, selective-pole tripping, bears on the problem of holding together systems with single tie lines. This is an extension of a previous development known as single-pole reclosing.

Most faults on single-circuit lines are thought to be single line to ground. The single-pole reclosing idea is to open and then reclose just one line instead of three. This permits the arc to go out, but holds the two ends of the system better as to frequency than if they were cut entirely apart. In case of faults involving two or three phases, all phases are opened in the conventional way in this new unit made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

The new development carries this idea further, to open two lines if they are involved in two-phase-to-ground faults or line-to-line faults, comprising most of the remaining types of faults. This leaves one line tying the system together, which, although not so effective as two lines, reduces the usual tendency for the two systems to swing apart in speed before reclosure.

This system has been tested in the field and laboratory, and, even under severe transients producing large phase-angle shifts, the relays are said to always select the correct phase or phases which are to be tripped.

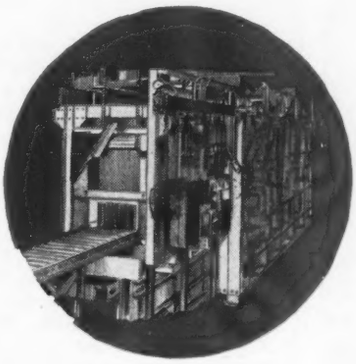
An improvement on carrier relaying may come about with relay HKB, that is said to determine whether or not a breaker should open by comparing the waves at the two ends of a line section.

The main feature of the new relay system is that it uses one relay for all three phases instead of one for each. Because it requires no voltage discrimination, no potential transformers are needed. It is inherently free from interpreting an out-of-step condition as a fault.

ENGINEERING

Plus. . .

Postwar competition among manufacturers in the metal-working industry will put a high premium on production economy. Because effective heat treatment is so important in determining production costs and product quality in many instances, heat treating processes and equipment merit the closest scrutiny today.



The principal characteristic of the design of a Holcroft Heat Treating Furnace is that it combines combustion and metallurgical engineering with more than 30 years of experience in this one specialized field.

Of this combination, experience is the more important for it is the best assurance that the furnace, when put into commission, will do just what is expected of it and operate at a minimum cost.

Before carrying your postwar plans any farther, consult with Holcroft engineers on your heat treating procedure.

BUILT BY HOLCROFT & COMPANY DETROIT-MICH.

Leaders in Building and Designing Electric and Combustion Furnaces, Kilns and Ovens

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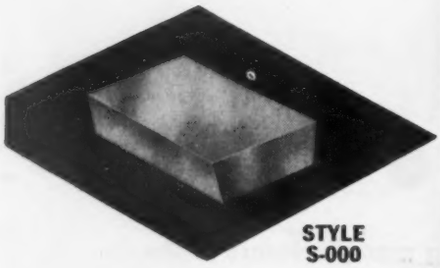
CANADA—Walker Metal Products, Ltd., Walkerville, Ont.

New

KENNAMETAL

"Universal"

BLANKS



STYLE S-000

FACILITATE TOOL MAKING

and Keep Stocks Down

These new Kennametal "Universal" tool blanks are literally "jacks-of-all-trades." Rectangular in shape, with 12° clearance angle formed on one long edge, they can be used to make many different types of tools, simply by setting them into open-end recesses, as illustrated. They are available in all recognized standard sizes, many of which are stocked in several grades.

Their use reduces inventory investment, and simplifies stock room problems. And, above all, they make it easier for you to employ on a wide-spread, yet economical scale, the advantages of Kennametal — its ability to cut metal, including steel up to 550 Brinell hardness, accurately, at greatly increased speed, with amazing tool life.

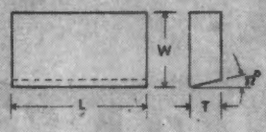
Catalog particulars, and prices, are yours for the asking.

KENNAMETAL

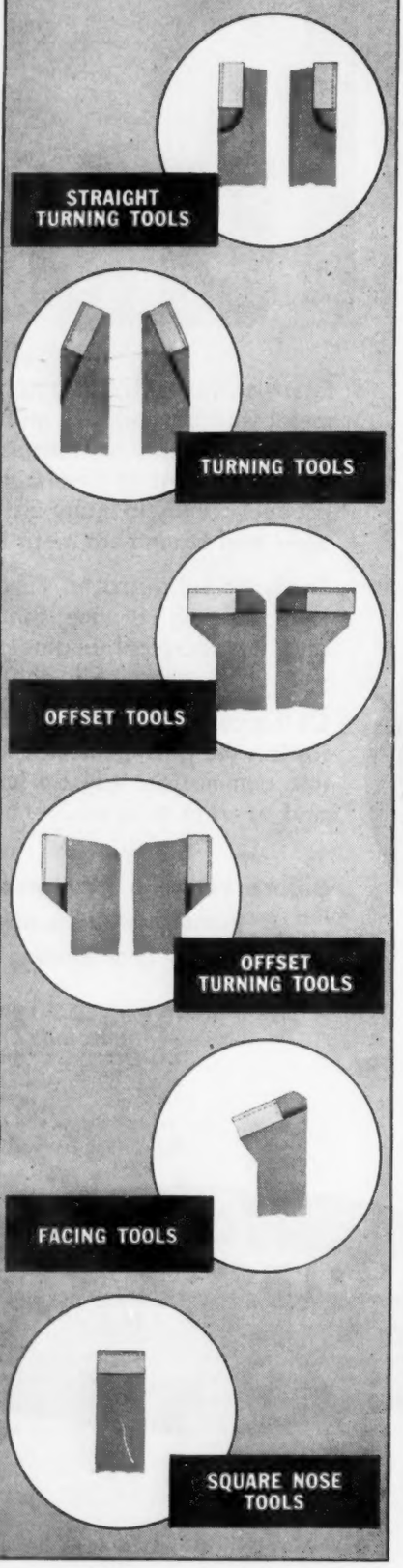
SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

ONE STYLE TOOL BLANK



FOR ALL THESE JOBS . . .



Dry Blasts

(*Continued from Page* 98)

attributable to mechanical failures in the dry blast plants. These mechanical failures have not been complete, but if success is to be achieved, the furnace operator must have absolute confidence in the reliability and dependability of his dry blast plant.

Burden must be determined about 12 hours in advance, and the responsible operator cannot be expected to do this, if he must live in fear of suddenly and unexpectedly losing his dry blast for the consequences of sudden increases in moisture are packed with trouble. The ensuing rough operation may last for several days, during which much production will be lost and product may be badly off-grade.

2. Some lack of success has undoubtedly been attributable to unforeseen bottlenecks resulting from the existing condition of a furnace or perhaps its design. This, again, is a question to be left to appropriately qualified experts. But, after all, it should be remembered that the main objective in these days is to make iron—not to prove dry blast.

3. All of the installations which have been made since Pearl Harbor, have been contending with the exigencies of wartime production. They have had to use coke, ore and stone of undesirable and widely varying characteristics. In other words, they have had to contend with factors which have brought back into current practice many of the variables of the early days.

Two Purposes Served

Fundamentally, dry blast is a tool for eliminating one of the major variables in blast furnace operation and can be made to serve two different purposes: in wartime, to drive for maximum production; in peacetime, to strive for fuel economy, smoothness of operation uniformity of product and low cost.

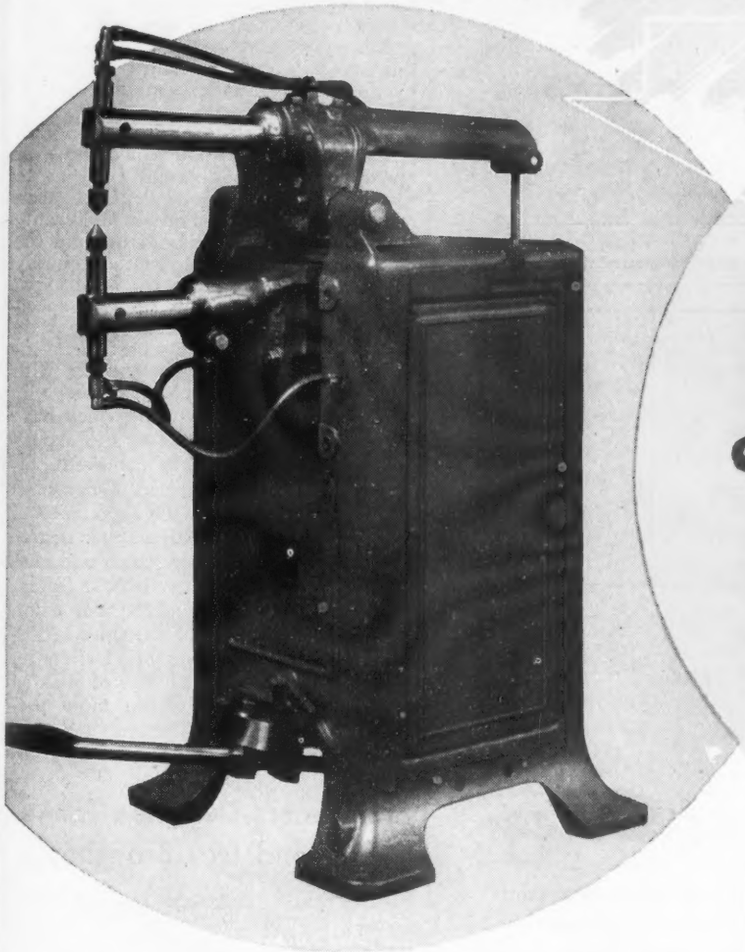
It offers five major advantages:

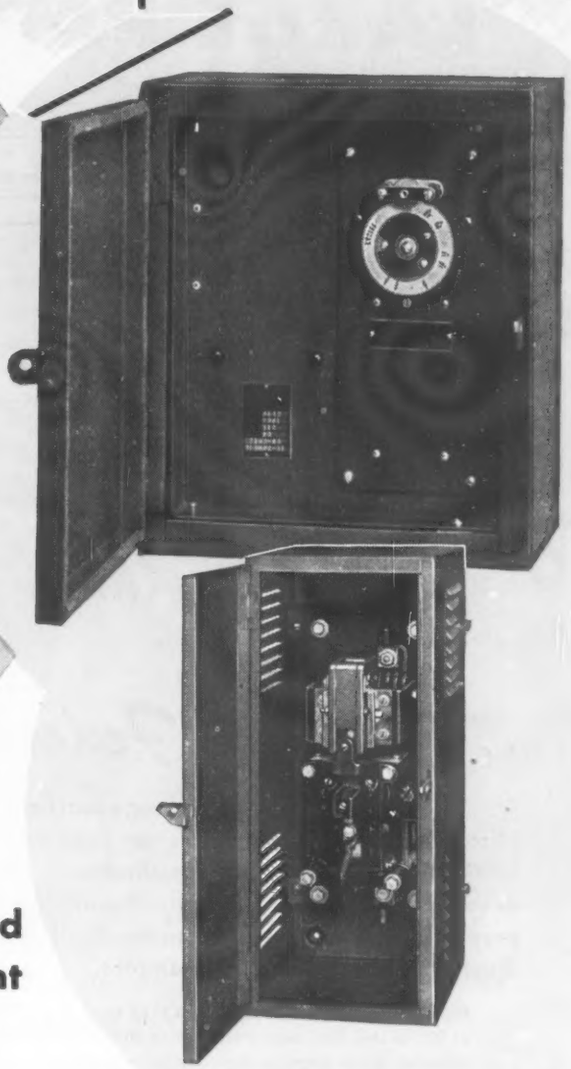
1. The operation of other auxiliary equipment is simplified, by its feeding air to the blowers at a constant temperature and a constant humidity. With that type of plant, there is no need of continually, hour by hour, readjusting blower speed to make it deliver a constant weight of oxygen.

2. The cost of maintenance is reduced, by its feeding clean air to the blowers. Normally much abrasive dirt and dust is suspended in the air around the blower house. This grit, if not removed, damages valves of blowing engines or abrades the precisely-balanced rotors of turbo-blowers. Removing and cleaning valves is not costly but the loss of power with leaky valves can run into a considerable cost. The replacement of an unbalanced rotor is a major maintenance item. If, in addition, chilled air is fed to the blowers, power is saved because the power to compress air is a direct function of its absolute temperature.

3. With respect to increased production, constant moisture permits driving the furnace safely up to the limit of other applying variables or factors. Sudden changes in moisture cause sudden changes in the temperature of critical furnace zones. Without dry blast, there must be withheld, a reserve for meeting sudden changes in moisture. But when this danger is eliminated, all of this reserve

How to modernize Spot Welders for as little as $105.00!





Safront Timer and High-Speed Contactor eliminate human element and assure *uniform* weld quality

Spoilage goes down and production goes up when welding power is controlled *automatically*. And it's a simple matter to equip machines, now in service, with modern timers and contactors for that purpose.

Your nearest Square D Field Engineer will be glad to check up on your present welding equipment. Quite often, such check-ups lead to substantial improvement in quality and output—at very little cost.

Top—**TYPE TBS-1 SAFRONT TIMER** automatically controls duration of welding current. All "live" parts are behind a protective panel. Timer adjustments can be made simply by turning the small knurled wheel on the panel front. Timer dial is calibrated 3 to 100 cycles.

Bottom—**HIGH-SPEED CONTACTOR** closes and opens the circuit to the primary of the resistance welding transformer. It is designed specifically for fast operation and heavy loads. Notice ample ventilation and generous wiring space. Knockouts for conduit entrance are provided in both top and bottom.

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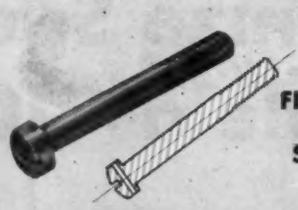
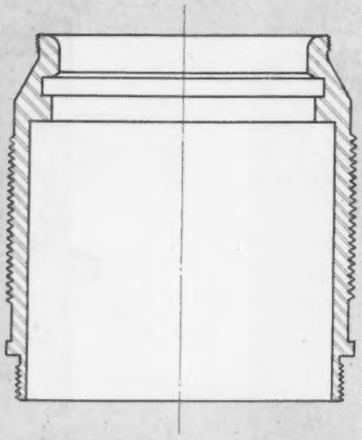


FILLISTER HEAD SCREW

LARGE PARTS?



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Fillister Head Screw: 5/16" SAE X3135 steel. Head slotted, and cross-drilled at 90° to slot. Hole accurately located with relation to back of head. All burrs removed, sharp edges broken, and piece cadmium plated.

Telescope Eyepiece Cell: 2⅝" SAE X1112 steel. Largest I.D. and adjacent I.D. finished to .002" tolerance. Threads milled on ends and on large O.D. Latter thread is 2.520" N.S., .0625" pitch, .50" lead (eight threads).

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***All* machining operations—heat treating—plating—cold heading and thread rolling—whatever your work may call for, the equipment to do it best will be found at Federal Screw. And we have the production know-how gained from many years as specialists in this field. That's why it will pay you to "focus on Federal Screw" for your peacetime needs ahead. Without obligation on your part, let's talk it over—*now*.**

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can be safely applied to the production of more tonnage.

4. With respect to fuel economy, there is no challenge of the governing laws which state, in effect, that, as the moisture content of furnace blast increases, more carbon must be burned to produce a ton of iron. In the successful operations, results have been in line with those promised by theoretical analysis. In others, this economy has, no doubt, been hidden by the effects of other variables, uncontrollable at the time.

5. With respect to a more uniform product, regularity and smoothness of operation reduce off-grades both as to specification and temperature. In the case of mill iron, the advantages of uniformity extend on through the bessemer and the open hearth. In the case of either foundry or silvery iron, the furnace can be changed quickly and with certainty from one specification to another, can reduce off-grade product and can serve its customers' interests better by supplying them with iron of more precise specifications.

The foregoing are lessons, which have been learned, not only from the experience of those who have achieved outstanding success in the use of dry blast but also, in part, from the experience of those who have met with a lesser degree of success. The big lesson which underlies it all, however, is that dry blast is fundamentally a tool of regularity for eliminating one of the major variables in furnace operation. In terms of "Design for Tomorrow" the result is that of making a metal which will conform more precisely to desired specifications, and at a lower cost.

Sharpeners Designed for Round and Flat Broaches

An 8-page illustrated bulletin (No. CS2-44) by Colonial Broach Co., Box 37, Harper Station, Detroit 13, describes new broach sharpeners, models CS-72 and C82-84, designed for sharpening round and flat broaches, spline and serrated types, etc., from the smallest size up to 7 feet long with a maximum diameter of 6 inches (8-inch maximum width for flat broaches). By providing a means for maintaining original tooth form and cutting effectiveness in broaches, this machine is said to make it possible for shops to do their own broach sharpening, eliminating time lost in returning broaches to manufacturers for this operation.

Among the features of this model is the lightweight alloy sliding head which, mounted on full anti-friction double-row rollers, provides ease of sharpener operation. Available at slightly extra cost are dual-ratio micrometer hand wheels with which feed may be controlled to 1/10,000 inch. Also available at slightly added cost is a roller curtain for protecting the ways of the machine when table is moved to one side or another.

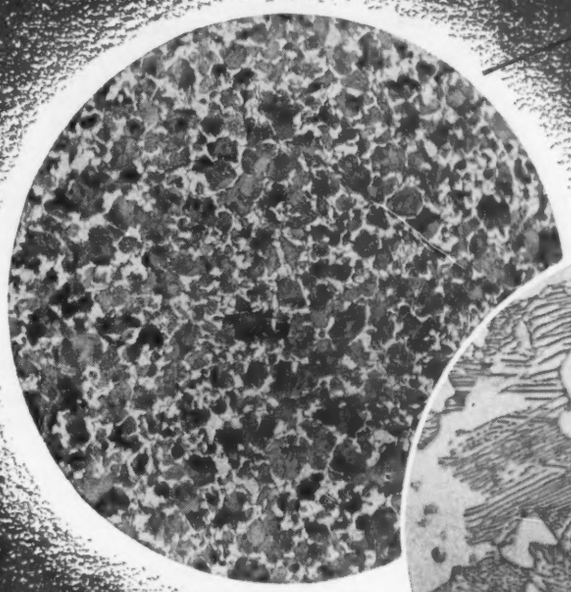
The booklet contains descriptions of cylindrical and flat broach sharpening operations, the machine's lubrication system, electrical controls, and general specifications for the two sharpeners, together with lists of standard and extra equipment offered.

WYCKOFF

Structure Controlled ANNEALING

insures

MAXIMUM MACHINABILITY



Moderate magnification (x200) discloses the pearlite grain size and distribution.

High magnification (x1000) reveals pearlite in detail.

MAXIMUM MACHINABILITY of ANNEALED STEELS requires the continual reproduction of a UNIFORM STRUCTURE by the annealing treatment. • The elimination of undue variations in STRUCTURE is a contribution toward more uniform MACHINING RESULTS. • Uniformity of structure also contributes to more uniform response to further heat treatment. The accompanying photomicrographs show a reproducible structure which is giving excellent machining results on commonly used medium carbon alloy steels.

May we submit factual data covering the desirability of Structure Controlled Annealing?

ARMY E NAVY

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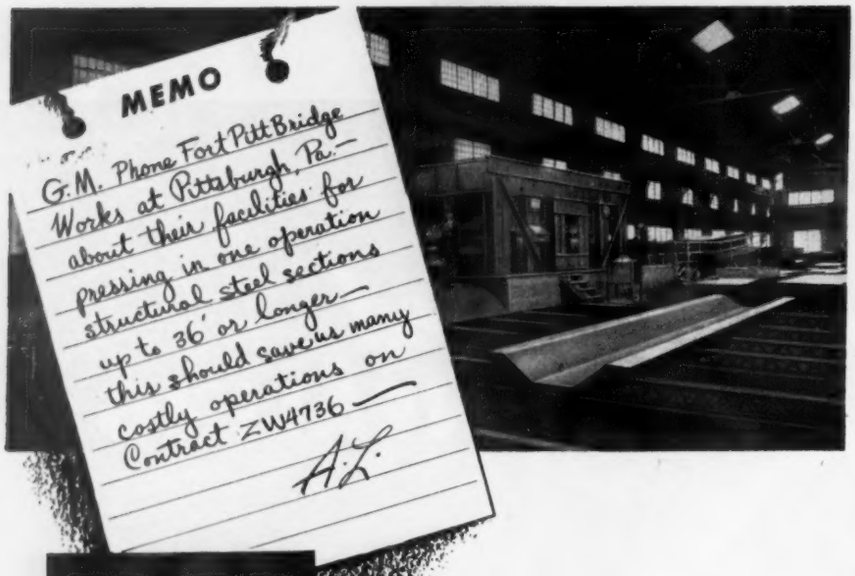
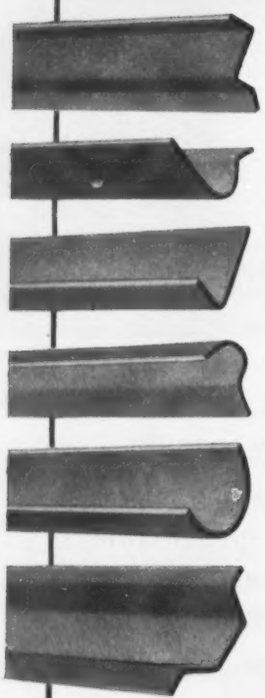

MEMO
G.M. Phone Fort Pitt Bridge Works at Pittsburgh, Pa.— about their facilities for pressing in one operation structural steel sections up to 36' or longer— this should save us many costly operations on Contract ZW4736—
A.L.

. . . and these are typical plate sections that can be pressed to uniform accuracy.



Descriptive Bulletin sent on request.

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Briefly here are a few facts: Practical and unusual types of formed plates; pressed to accurate dimensions —in one operation—up to 36 feet or longer; thus, length of formed section is no longer an obstacle; absolute accuracy without damage to grain structure; elimination of expensive operations and extra handling results in a finished product at materially lower costs.

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Overhead Cranes

(*Continued from Page* 108)

speed can be adjusted to give the various operating points required for the normal crane hoist job. One method of control employs the use of a saturable reactor in one motor lead of the wound rotor motor to secure this variable unbalanced effect.

Fig. 8 shows a block type schematic diagram indicating the general functional features of equipment involved in such a variable unbalanced voltage of "reactor" type of control. An indication of the motor speed is secured from the rotor circuit in which the voltage and frequency vary directly with the speed of the drive. Speed detector and amplifier circuits are used to give a direct current output proportional to the speed of the motor. This "speed sensitive" DC output is applied to the direct current terminals of a saturable reactor. Thus the reactor is saturated in proportion to motor speed and its impedance varies inversely as the speed. This results in a speed responsive variable unbalance of the motor primary voltages and produces speed torque characteristics as shown in Fig. 9.

Motor Has "Down" Torque

To lower a nonoverhauling light hook at a slow speed, it is necessary that the drive "motor", that is have down torque, in the down direction. This can be secured only by reversing the direction of the primary rotating field through a reversal of the phase sequence of the voltages applied to the motor terminal. Therefore, a phase shifting device is installed consisting of a combination of resistance and reactance. This shifting phase with the unbalance of voltage already obtained by the reactor produces a drive which will run without load at approximately 45 per cent synchronous speed.

The results obtained by such a control system are speed torque curves which cover the desired working area. Slow, moderate and high speed lowering is available at all loads from zero to 100 per cent; there is no tendency for the drive to hoist; and speeds of approximately 30 per cent and 98 per cent are available for lowering a light hook.

The phase shifting and reactor equipment used to give performance in quadrant III can also be used to give performance in quadrant I. This is illustrated by the first hoist curve (H-1) in Fig. 9. Such a characteristic permits hoisting of light loads at positive reduced speeds of 50 per cent or less.

For those drives requiring very special handling of a wide range of loads at slow speeds, an additional feature can be provided to permit the operator, by manipulation of a foot or thumb button, to secure performance anywhere in the shaded area to the right of L1. This is done by applying the bias to the detector and amplifying system which is independent of the speed. Since DC circuits are used in this control system, manipulation of the button at a

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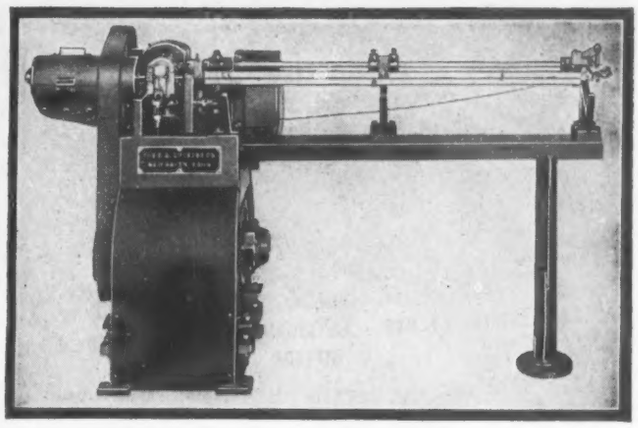

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Faster Cutting Speeds
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Outstanding Features—

Almost continuous wire travel
Lightning cut-off assures square-cut ends
High speed, direct driven 5-die straightening flier
Quiet, highly efficient V-belt motor drive
Ball and roller bearings throughout
Extremely rigid construction
Fully guaranteed as to material and workmanship.
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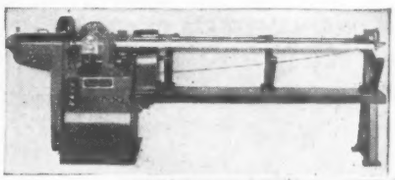
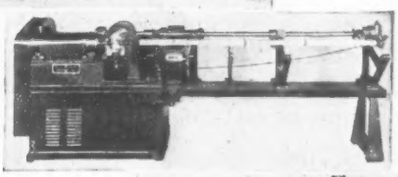
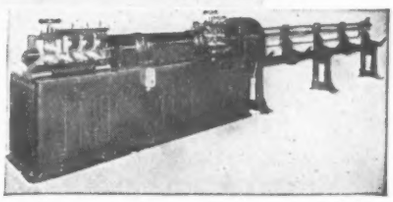


Type 1A
1/16"—3/16"
Dia.



Type 2A
1/8"—1/4"
Dia.

Type 3A
3/16"—3/8" Dia.
Type 4A (not shown)
3/8"—5/8" Dia.



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Automatic
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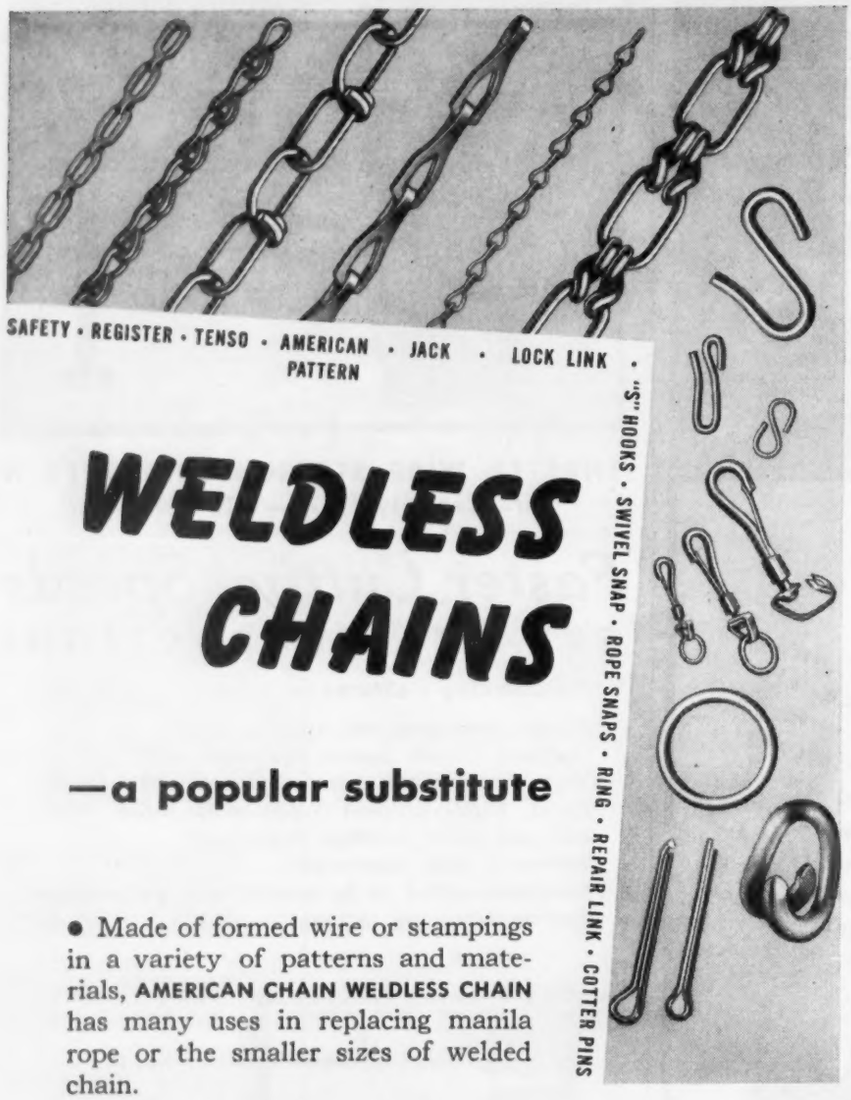

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From time to time we have open equipment for manufacturing the chains shown above—American Pattern in steel, the others in steel and brass. This also applies to the **ATTACHMENTS** shown: "S" hooks, rope snaps, swivel snaps, rings, and certain special designs.

COTTER PINS—Campbell Hammerlock and Acco Regular—are available. These cotters are precision-made, therefore easy to insert, lock and remove. Packed in substantial boxes, clearly labeled.

REPAIR LINKS—are available in six sizes. Acco links, with their long, tapering laps, can be closed cold or welded to make strong, safe repairs on broken chains.

We will continue working night and day to relieve existing shortages and meet increasing demands.

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moderate interval results in an averaging out of the characteristics obtained as the transition from one condition to the other is smooth.

This "reactor" control has been applied successfully on overhead cranes in a ship repair yard; gantry type cranes in shipbuilding service; and aerial tramway system at a coal mine and can be used for many other applications.

Fig. 10 is a tabulation of the various hoisting features offered by the five AC crane control systems.

Kraft Pulp Used In Smokeless Powder

Insurance against any future shortages of smokeless powder is provided by a new process which manufactures smokeless powder from the same low cost wood pulp used in kraft wrapping paper and bags. The new sulphate process to purify kraft pulp climaxes ten years of research by Western Cartridge Co., East Alton, Ill.

This process is said to relieve America of much of its dependence upon cotton linters for the production of nitrocellulose, base material of rifle and cannon powder. The amount of kraft pulp required to produce enough powder for a single carbon cartridge would make a piece of wrapping paper large enough to wrap up a small lemon.

Experimental lots of kraft pulp, produced by the sulphate process at Gaylord Container Corp., Bogalusa, La., have been successfully nitrated and manufactured into smokeless powder in government plants at Radford, Va., and Charlestown, Ind.

While wood is not a new source of cellulose in the production of nitrocellulose, the new sulphate process permits the use of woods of a lower grade and faster growing type than are now used in the older sulphate process.

The major difference between the two processes is that sulphite pulp is produced by treating wood chips with acids whereas sulphate pulp is produced by treating wood chips with alkalis. Southern pine, one of the most plentiful species of trees used in manufacturing wrapping paper and bags, yields readily to the new sulphate nitrocellulose process. The excess of pitch and turpentine in this pine makes it difficult to purify by the sulphate process.

The new sulphate process is stated to open a vast source of raw material for the production of smokeless powder in the event there should be a further restriction of supplies of cotton linters or of sulphate pulp. Experiments also are claimed to indicate that the process is less expensive. It is a fundamentally new development in powder-making. The company also has revealed that it has perfected a nitrocellulose purification process and the equally revolutionary smokeless ball powder process which permits manufacture many times faster than by conventional production methods.

Longitudinally Welded Plate

(*Continued from Page 86*)

affected zones in the base metal, many standard 0.505-inch test specimens were taken across the welded joint. The results of these tests show that the tensile properties of the weld metal and the heat-affected zones are very similar; both have higher ultimate strength, yield point and proportional limit values than the base metal. As would be expected, the elongations and reductions of area are somewhat less than the base metal, but the absolute results are very good. These values corroborate the inferences from the tests in the big specimens; namely, that the welded joint in the large specimens has slightly less capacity for elongation than that of the unwelded base metal.

In a similar manner a full size specimen cut from an actual Great Lakes ore carrier was tested.

The testing of the specimen from the actual ship shows that, even though the weld contained blowholes, the harm done by ill-made attachment welds and weld splatter was greater than that of the blowholes. All welding operators should be instructed to strike their arcs immediately in the path of the weld that is to be deposited rather than dragging their electrodes across the plate and into the joint to be welded.

In general, however, the strength and longitudinal efficiency of the ship specimen was fairly high even in spite of the harm which had been done to it.

Other subsequent full size specimens tested included T-type of gunwale construction, short flat plate specimens, and long flat plate specimens. Space does not permit detailing them here.

General Discussion of the Complete Test: In the complete investigation, five welded specimens were free from cracks and were not subjected to restraint imposed by improper welding procedures, and were tested as welded. These five specimens had an average longitudinal efficiency of 100.3 per cent and an average elongation of 20.7 per cent.

There were also four virgin base metal specimens, both long and short, that were tested without stress relief annealing. These had an average longitudinal efficiency of 97.5 per cent and an average elongation of 24.4 per cent. It will be seen, therefore, that large welded specimens made of about as thick plate as is ever encountered in shipbuilding were able to sustain loads equal to the full capacity of the steel and undergo elongation almost equal to that of the virgin base metal. *Apparently the clue to the problem of the cracking in ships does not lie in inadequate elongation of large welded structures, per se.*

In 13 out of the 14 welded angle, T, short and long flat plate specimens tested without subsequent heat treatment, failure occurred by a sharp square fracture originating in the weld. In none, however, did failure occur until after appreciable elongation had obtained, and in many cases after *very great*

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No wonder Weldisks cut faster and longer! No wonder they're safer, more economical to use. Use them yourself on all tough grinding jobs – *the tougher the better with Weldisks!* Available in all grits 320 to 16.

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elongation had been secured in the weld.

In only one property did this ordinary steel, such as has been used for years for building ships, exhibit any low values and that was in its notch-bar toughness. Fifty-six tests were made at minus 20 degrees Fahr. on 1¼-inch steel from seven different heats and the average notch-bar impact value was 2.4 foot-pounds.

In this connection, it is most interesting to note that the Charpy notch-bar impact value of the Unionmelt weld metal at minus 20 degrees Fahr. was equal to or superior to that of the rolled steel. This was true no matter how the notch was made. Also the notch-bar impact value of the heat-affected zone of the base metal was likewise equal to or superior to that of the virgin base metal.

Thus it will be seen that by this criterion *the metal in the welded joint is inherently no less tough than that of the virgin base metal and no more likely to instigate crack propagation.* On the other hand, the weld is far more likely to contain flaws to create notches. Further the weld and vicinity contain high residual stresses as welded.

Toughness in Steel Defined

Toughness in steel may be defined generally as the ability to endure deformation without fracture, particularly in an adverse state of stress. Toughness may be measured in many ways, such as determining the energy of deformation absorbed in elongation or in bending. Thus, there may be many indices of toughness.

One measure that is often used is the energy absorbed in breaking a notch bar. In a notch such as is used in the Charpy impact test, a triaxial state of stress exists just below the bottom of the notch. When this test is used as a measure of toughness of steel, toughness might be defined in a narrower sense as the ability of a metal to absorb energy before fracture, when subject to triaxial tension, in a standardized notch.

In the notched tension specimens, triaxial stresses existed at the bottom of the notch as evidenced by the high figures for strength. With ordinary methods it was not possible to measure the amount of the elongation preceding fracture. Had more precise means been used, undoubtedly a certain amount of local elongation would have been found. But in any event, the energy absorbed would have been small because so small a volume of metal endured deformation. It was hoped in the short wide flat specimens to approach at least partially the condition exhibited in the notched specimen, but no significant increase in nominal tensile strength was obtained and great elongation was secured. However, square fracture over most of the area of three out of four virgin base metal specimens was observed.

Many cracks and failures have occurred when the ship was on the building ways and under no external loading whatsoever. In our northern building yards in winter, a ship on the ways with the steel at the temperature of the night

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- in electric furnaces
- of carefully selected materials
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- resulting in an exceptionally sound and clean product, which
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before can have portions of its deck and shell warmed by the rising sun, while other portions are in the shade. *Differential expansion can thus cause stress and it may be that these stresses are more severe than loading stresses.*

In most cases of ship failure, the temperature has been low when the toughness of the steel was at a minimum, but in the case of the ship on the ways in winter, low temperature not only reduced the toughness of the steel but nonuniform temperature distribution causes the stresses.

Thus far little has been said about "locked-up stress." What part does it play in this picture? Recent experiments have shown that longitudinal stress (assuming elastic behavior) on the order of 45,000 to 50,000 pounds per square inch exists in joints in plating of the thickness with which we are concerned in shipbuilding. This stress diminishes away from the weld and becomes negligible at about 4 inches from the centerline of the joint.

In relatively free plates the transverse locked-up stress is low. If the degree of restraint is great, however, transverse stress can become sufficient to crack the joint as was shown in some of the specimens in this test.

No trepanning was done throughout our experiments to determine residual stress, but it is safe to assume that all the as-welded specimens contained longitudinal residual stresses of the order of magnitude described in the foregoing. It was seen that these specimens made of thick plate and containing these residual stresses when tested at the relatively low temperature of plus 20 degrees Fahr. were capable of developing practically the full ultimate strength and elongation obtained from a virgin base metal specimen, certainly far more strength and elongation than the joint could be called upon to develop in a ship.

Our strain measurements indicate that the metal in the joint is flowing plastically while the remainder of the specimen is elongating elastically. The addition of transverse locked-up stress caused by external restraint resulting from the rigid welding procedure reduced the ability to flow plastically and reduced the elongation obtained from the short flat specimens as would be expected.

In short, all of the foregoing merely points out that without severe notches of considerable extent, *we were not able to set up a state of stress that would cause a brittle failure to occur in a welded structure of heavy ship plate.* To be sure, an approach to this state was clearly shown. It follows then that a more drastic prevention of flow existed in the actual ship.

Various factors contributing to this condition would be more severe notches, lower temperature and larger size of structure. The notches could result from cracks occurring during construction or could originate from bad design or faulty workmanship.

The change from plasticity to brittleness under a notch in steel occurs at some temperature which is a function of the sharpness of the notch. The reported temperatures of ship failures suggest that a fairly sharp notch was responsible.

In the final analysis, it now appears that it would be most logical to search for notches when seeking the cause of ship failures.

Conclusions: The following detailed conclusions may be drawn from this test:

—That good strength and elongation can be obtained from longitudinally welded joints of heavy plates in both the angle type and the flat plate type, although considerably less elongation occurs in the T type when automatically welded with the deck in the horizontal plane.

—That a square type of fracture is practically always obtained from welded joints pulled longitudinally.

—That the occurrence of a sharp square fracture is not an indication of the absence of ductility in the steel.

—That at extreme elongation the welds will crack at intervals to accommodate themselves to the greater ductility of the base metal without preventing further elongation. The smothered arc welds, while smoother than the hand welds perform but little better than the latter. Hand welds with the reinforcements ground off may be slightly supe-

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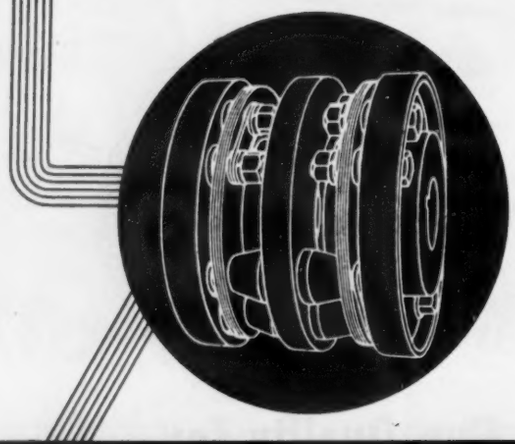

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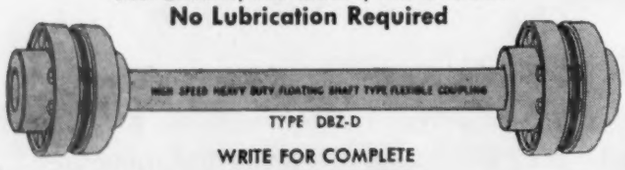

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rior to those with the reinforcements on, but the former crack almost as much as the latter.

—That the tensile properties of the smothered arc weld metal and heat-affected zones when removed are very similar to those of the unaffected base metal.

—That the presence of small round blowholes in the weld reduces the tensile strength of the welded structure but little, but may cause considerable reduction in its ability to elongate. The latter, however, is not a serious practical fault because the strength and elongation found in the pertinent tests are far in excess of that which could ever be utilized in a ship structure in service.

—That the careless striking of arcs on heavy plate material in cold weather can cause serious local increases in hardness which can readily give rise to cracking and could conceivably be the start of a ship failure.

—That the plate material cut from an actual failed ship still retains almost all of its original ductility.

—That T-joints between the sheer strake and deck stringer should probably not be welded with an automatic process because it is difficult, if not impossible, to make such a weld that does not contain longitudinal cracks.

—That the presence of longitudinal cracks in the weld is definitely undesirable, mainly because at places they may contain branches which could readily become transverse cracks and cause failure of the structure.

—That abrupt changes in section in a structure are points of weakness even under static loading because of stress concentration and inefficient use of part of the metal.

—That even with the short flat welded specimens designed to provide lateral tension, it was not possible to obtain significant increases in strength accompanied by decreases in elongation, although it was possible to produce sharp square fractures in almost all cases.

—That stress relief annealing considerably increased the elongation of both base metal and welded joint specimens.

—That joints which have transverse residual tension through restraint develop less overall strength and considerably less elongation than those which contain primarily residual longitudinal stresses.

—That the performance of the large long tensile specimens compares favorably with the performance of small coupons of the same steel.

—That the notch-bar toughness of thick mild steel plate at minus 20 degrees Fahr. is naturally low.

—That the notch-bar toughness of the weld and welded joint is very similar to that of the base metal.

—o—

Methods have been found by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., for plating beryllium and tantalum from fused salt baths. Tantalum-plated anodes in vacuum tubes offer possibilities of low secondary emission, and serve as stray gas absorbers.

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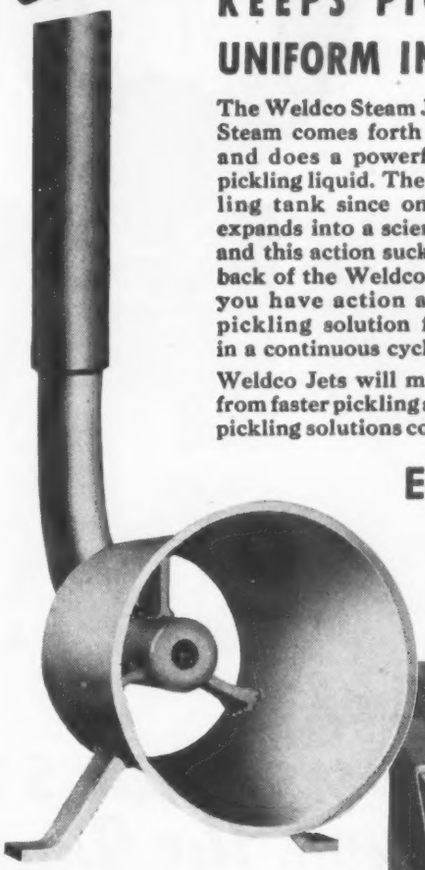

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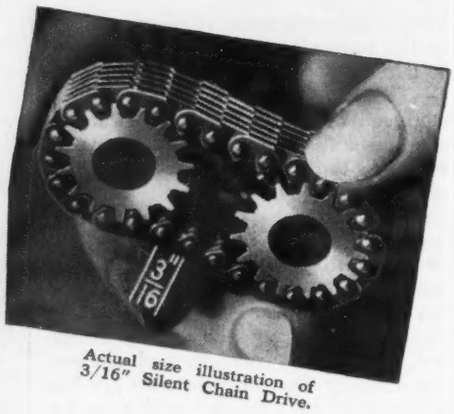
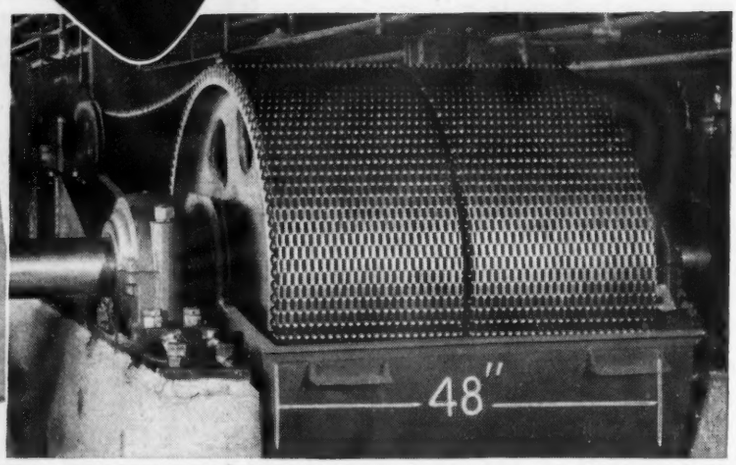


Actual size illustration of 3/16" Silent Chain Drive.



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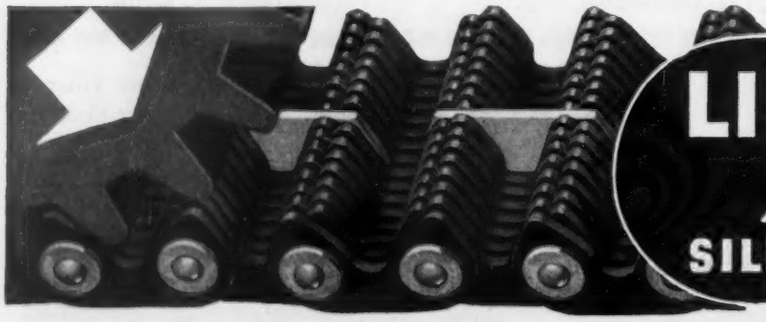

LINK-BELT
Silverstreak
SILENT CHAIN DRIVE

Helpful Literature

1. Mounted Wheels & Points

A. P. de Sanno & Son, Inc.—20-page illustrated catalog and price list on Radiac mounted points and mounted wheels describes aluminum oxide and silicon carbide grades which are available. Standard shapes of wheels and points are shown full size. Also described are Por-Os-Way abrasive points and wheels which eliminate burning.

2. Chucking Reamers

Chicago-Latrobe Twist Drill Works—4-page illustrated bulletin on "High Speed Spiral Fluted Chucking Reamers" gives specifications of these taper shank and straight shank cutting tools which are available in diameters ranging from ⅛ to 1½ inches and in lengths from 3½ to 12½ inches.

3. Precision Gage Blocks

Dearborn Gage Co.—20-page illustrated booklet "The Saga of Ellstrom" relates biography of the Ellstrom family and discusses facilities of company which is now engaged in making precision gage blocks.

4. Flexible Metal Hose

Chicago Metal Hose Corp.—12-page illustrated bulletin No. E-144 discusses flexible metal hose for all types of industrial use. Pressure hose is available in galvanized steel, bronze and other alloys. Corrugated flexible metal hose is made in steel, bronze and alloys. Sizes and specifications are given for various types of hose.

5. Alloy Steels

Bliss & Laughlin, Inc.—16-page illustrated supplemental manual to Section 2 of "Fiftieth Anniversary" Book covers machineability and cutting speeds of cold drawn bar steels. Engineering data are included on various alloys available in this form. Also offered is 8-page section 1 which is supplement to same manual containing revised data on open hearth and electric furnace alloy steels, alloy grades of National Emergency steels and interim standards for automotive steels.

6. Ground Taps

Sossner Tap & Tool Corp.—76-page illustrated catalog No. 44 on "Ground Thread Taps" contains complete information on standard and special taps. Itemized sections cover basic tap terms, tap selection for desired classes of fit, specifications of standard and special taps, details of threading tools, precision thread grinding services, ground thread tap limits and tap blank dimensions. Tapping data are included in engineering appendix.

7. Hydraulic Press

Denison Engineering Co.—4-page illustrated bulletin "Introducing Multipress" gives details of new, versatile, hydraulic, bench-type press which affords ram speeds up to 200 inches per minute and ram pressures from 300 to 8000 pounds. This compact unit forms basis for all types of individual and production pressing, forming, punching, stamping and other operations.

8. Indoor Disconnects

Delta-Star Electric Co.—4-page illustrated bulletin No. 4401 is descriptive of high capacity indoor disconnects ranging in size from 2000 to 5000 amperes. Construction and features of these silver-to-copper, high pressure button contact switches are described. Full specifications are given on all sizes and types.

9. Inert Gas

Davison Chemical Corp.—12-page illustrated bulletin No. 301 is entitled "Inert Gas for Blanketing, Purging and Process." Generation and application of inert gas for explosion prevention, processing and other uses are described. Data is summarized on limits of inflammability of various gases and vapors.

10. Hot Dip Tanks

Aeroil Burner Co.—16-page illustrated catalog No. 286 presents details on "Aeroil Dipmaster" tanks for hot dip cleaning, degreasing, rustproofing, metal finishing and finger-print neutralizing. All sizes and types of hot liquid dip tanks in portable and permanently installed models are covered. Most of these units are completely insulated and are thermostatically controlled.

11. Removable Stickers

Avery Adhesives—8-page illustrated booklet entitled "41 More Ways Removable Stickers Speed Production" explains methods which have been developed by leading war materials producers in identifying and marking parts in production. Typical labels which can be applied to practically any surface without moistening are shown. These stickers are easily peeled off in one piece without scraping or tearing.

12. Conveyors

Alvey-Ferguson Co.—6-page illustrated bulletin entitled "Conveyors That Are Helping Bring Victory Faster" contains brief descriptions of apron and roller, groove apron, overhead trolley, concave roller, portable trough belt, roller, combination roller and pusher and truck towing conveyors which are being used in production of ordnance and war materiel.

13. Carbide Mandrels

Carboloy Co.—20-page illustrated booklet entitled "Tips For Tube Mills" discusses use of Carboloy mandrels and explains advantages obtained. Use of these tungsten carbide mandrels is claimed to produce better inside finish, give close tolerances on long runs, increase footage, permit continuous operation, afford long mandrel life and minimize costs with fewer rejections.

14. Chain Hoist

Chisholm-Moore Hoist Corp.—4-page illustrated bulletin No. 100-I includes price list and design details of Cyclone ball bearing hoists which feature gyrating yokes and ball and roller bearing construction throughout. These chain hoists are available with capacities ranging from ¼ to 6 tons.

15. Diesel Engines

Caterpillar Tractor Co.—32-page illustrated booklet No. 8657 describes tasks which Caterpillar diesel engines are performing on home front. Applications include emergency power supply for airport, powering of boats, lighting municipalities, providing light and power for repair shops and hospitals and other such uses where unfailing source of power is required.

16. Stainless Identification

Carpenter Steel Co.—Illustrated chart is designed to aid in identification of various types of stainless steels which may have become mixed in stock. Stainless steel type numbers are charted and 11 tests for separating various types are described. These tests include nitric, muriatic and sulphuric acid tests; magnet, spark, hardness, nickel spot and stabilization tests. Procedure for each is described.

17. Sump Tank Cleaning

W. R. Carnes Co.—4-page illustrated bulletin on Model 20-T sump tank cleaning machine describes this unit which removes sludge, chips, oil, coolant and other materials from sumps of lathes, grinders, screw machines and honing machines. Coolant is filtered and stored for re-use.

18. Ball Bearing Units

Stephens-Adamson Mfg. Co.—4-page illustrated bulletin No. 244 gives details of Seal-Master ball bearing units which are available in pillow block, take up, flange, cartridge and extended inner ring bearing types. Also available are four bolt base pillow block and flange cartridge units. Normal, standard and medium duty bearing units are available for shafts ranging from ½ to 4 inches in diameter.

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19. Special Machines

Cross Co.—123-page illustrated catalog on "Cross Special Machines" gives case history of wide range of special machines which consist of one or combination of turning, milling, drilling, boring, reaming or grinding operations. These units are fully automatic and are controlled by push button. In addition to briefly describing 35 different special machines, case studies of their operation are included.

20. Press Brakes

Cincinnati Shaper Co.—64-page illustrated catalog No. B-2 describes complete line of Cincinnati All-Steel press brakes which are adaptable for forming, corrugating and curving, notching and forming, punching, embossing, trimming and other operations. In addition to describing machines, engineering data are given on press brake operation. Various dies and other accessories for use with machines are described.

21. Steel Gate Valves

Edward Valve & Mfg. Co.—6-page illustrated catalog No. 12-E is descriptive of cast steel gate valves which are available in 300, 600, 900 and 1500 pound per square inch steam pressure constructions. Sizes range from 2½ to 12 inches. Details of design and specifications for each type are given.

22. Marking Tools

M. E. Cunningham Co.—4-page illustrated bulletin on "Safety Marking Tools" describes various types of steel stamps, holders, rollers and other marking tools which will not spall or mushroom. Details are given on wide variety of safety, date and inspection symbols which are available. Either hand or mechanical type tools are described.

23. Clamping Devices

Siewek Tool Div., Domestic Industries, Inc. —44-page illustrated catalog gives specifications and includes working drawings of clamping assemblies of all types. Exact size drawings are included for placing under tracing. Clamps and fixture accessories are included.

24. Broach Sharpening Machine

Colonial Broach Co.—8-page illustrated bulletin No. CS2-44 gives complete details on Model CS2 broach sharpening machine for flat and round broaches ranging from smallest size up to 7-foot lengths with maximum diameter of 6 inches or maximum width of 8 inches for flat broaches. Machine provides rapid and accurate means for maintaining original tooth form and cutting effectiveness in broaches.

25. Chain Hoists

Chester Mfg. Co.—12-page illustrated bulletin No. D 557 gives specifications and describes features of line of chain hoists which are available in Timken roller bearing and ball bearing equipped types in capacities ranging from ⅛ to 10 tons. Also described are steel plate trolleys and Timken bearing equipped trolleys for use with these and other hoists.

26. Hot Work Tool Steels

Crucible Steel Co.—16-page illustrated bulletin No. 6, revised, discusses application, compositions and treatments of hot work tool steels. Tools for hot working steel and iron, aluminum and zinc, copper alloys and shell forgings are described. Dies, punches, shells, rivet sets and other tools are covered. Recommended compositions, heat treatments and hardnesses are given for each tool and application.

27. Shaft Seal

Crane Packing Co.—4-page illustrated bulletin "The Perfect Mechanical Seal" is descriptive of John Crane Bellows-Type shaft seal which is adaptable for centrifugal and rotary pumps, refrigeration compressors, gear boxes, speed reducers and other industrial applications. These synthetic rubber bellows-type units are available for shaft diameters ranging from ¼ to 3 inches. Typical applications are shown.

28. Vertical Milling Machine

Cincinnati Milling Machine Co.—24-page illustrated bulletin No. M-1284 describes Cincinnati 28-inch series vertical Hydro-Tel milling machine. This equipment is adaptabe for conventional milling operations, for die sinking and similar operations requiring duplication of convex and concave contours and for automatic profiling from master template on either selective or non-selective basis. Complete specifications and features of machine are presented.

29. Heavy Duty Metal Saws

Consolidated Machine Tool Corp.—20-page illustrated bulletin No. 537 presents specifications and describes features of Newton cold saw machines with hydraulic feeds. Heavy duty machines are made in 32 to 48-inch sizes. Extra heavy duty machines which have adjustable work tables are made in 56 to 120-inch sizes. Also available are high speed machines and special cold saws for armor plate.

30. Magnetic Chuck & Control

Continental Machines, Inc.—4-page illustrated bulletin on the "DoAll Selectron and Electromagnetic Chucks" describes electronic device which furnishes direct current for magnetic chuck operation and provides accurate control of magnetic pull as well as demagnetization of chuck. Magnetic chucks are available in two sizes for operation on 110 or 220 volts direct current. Control operates on 220 or 440 volts alternating current.

31. Power Fork Trucks

Clark Tructractor Div., Clark Equipment Co. —24-page illustrated "Clark Pictorial" Vol. 4, No. 1 depicts use of fork trucks in evacuation of wounded men by transport plane, handling of goods shipped by air, speeding handling of materials and other war time uses. Also shown are war action scenes illustrating how other Clark products are being used. These include tractors, axles, housings, transmissions, wheels, gears, forgings and blind rivets.

32. Metal Cleaners

Detrex Corp.—8-page illustrated booklet No. 267 on Triad Alkali Cleaners describes alkali and emulsion cleaning compounds developed specifically for all types of metal cleaning operations. Many uses and applications of alkali cleaning materials in aircraft, automotive, railroad, metal fabricating and other industries are described.

33. Drop Forging

Drop Forging Association—40-page illustrated technical bulletin "Metal Quality—Hot Working Improves Properties of Metal" deals with characteristics of forging materials and discusses hot working technique. Improvement in metal quality obtained by various processes of forging cast metal are covered. Typical products produced by forging operation are shown.

34. Nonferrous Alloys

Central Steel & Wire Co.—36-page illustrated booklet entitled "Nonferrous Alloy Specifications" contains A.S.T.M., A.M.S. and S.A.E. as well as government specifications on brass, copper, bronze, aluminum and magnesium. All alloys are listed under specification number. Approximate composition, available forms and cross classifications are given. Included is hardness conversion table and standard gages.

35. Transfer Paper

Eastman Kodak Co.—22-page illustrated booklet on "Kodak Linagraph Transfer Paper" discusses use of this paper to sensitize sheets of metal, plastic, wood, glass, leather and other materials for photocopy reproduction in producing templates, dials, transparent scales and grid lines. Full instructions on use of this material are included.

36. Water Treatment

Dorr Co.—24-page illustrated bulletin No. 9041 describes Dorrco Hydro-Treator. This self-contained water treatment unit combines flocculation, thickening and clarification into single unit and individual steps are performed in sequence in three separate zones. Capacities range from 40 to .1 million gallons per day for all types of water treatment.

37. Heat Exchangers

Downington Iron Works—24-page illustrated bulletin on "Heat Transfer Equipment" covers manufacturing facilities of concern and contains information on design of heat exchangers, formulas, standard constructions, tube layout tables and details of typical heat exchange units. Also described are finned tube units which afford maximum heat transfer.

38. Foundry Sand Testers

Harry W. Dietert Co.—4-page illustrated bulletin entitled "For Better Castings" describes Hitemp Dilatometer which is designed to afford easy and practical solution to difficult foundry sand problems. Causes of such defects as rat tails, scabs, buckles, fissures, veining, metal penetration, oxide penetration, blows, dirt and cuts are solved through tests with this unit.

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Some Steel Prices Raised; Buying Heaviest in Months

Deliveries pushed far ahead in most products. . . Storm conditions hamper output. . . Pig iron and scrap supply show scarcity

INTERIM increases of $2 to $5 per ton in ceiling prices of five basic steel products marks the first break from prices frozen in 1941, with the exception of two minor changes to adjust inequalities. The increases are based on a cost survey conducted before the steel wage case came up and have no relation to the advance recently approved as a result of the War Labor Board's decision in that case.

The new prices are effective as of Jan. 11 and apply to carbon plates, hot-rolled carbon and galvanized sheets, rails, and nails and staples.

Steel buying, now by far the heaviest in recent months, continues to expand, involving bars, sheets, strip, plates, shapes and wire in the upward trend. Various specialties, including alloys, in general are more active than for more than a year.

Contributing to this upsurge is not only expansion in critical war programs, notably guns and ammunition in large variety, but also rapid increase in the schedule of parts replacements and a disposition among buyers generally to increase inventories where possible, contrasting with the tendency to curtail, only a short time ago. Some lines, including rails and tin plate, are being affected adversely, schedules being reduced to provide more steel and rolling facilities for urgently needed munitions requirements.

Severe weather, as well as demand, have contributed in some degree to mounting backlogs in some districts, retarding rolling schedules and checking movement of pig iron and scrap. Pressure for these basic materials is now greatest in months. Deliveries in general fall into second quarter and even later, though occasional promise of an earlier shipment is possible. Considerable current business now can obtain no better than third quarter scheduling. Directives are being used again to expedite material most urgently needed, thus pushing back other pressing tonnages already scheduled.

DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week Ended Jan. 13	Change	Same Week 1944	Same Week 1943
Pittsburgh	89	None	97	97.5
Chicago	98.5	—1	101	102
Eastern Pa.	95	None	96	96
Youngstown	81	—9	95	97
Wheeling	98.5	+1	94	80
Cleveland	86	+8	90.5	91
Buffalo	51	+19	90.5	90.5
Birmingham	95	None	95	95
New England	92	+5	89	95
Cincinnati	92	+2	90	97
St. Louis	75	None	85.5	93
Detroit	88	None	91	93
Estimated national rate	94	—1.5	°99	°99

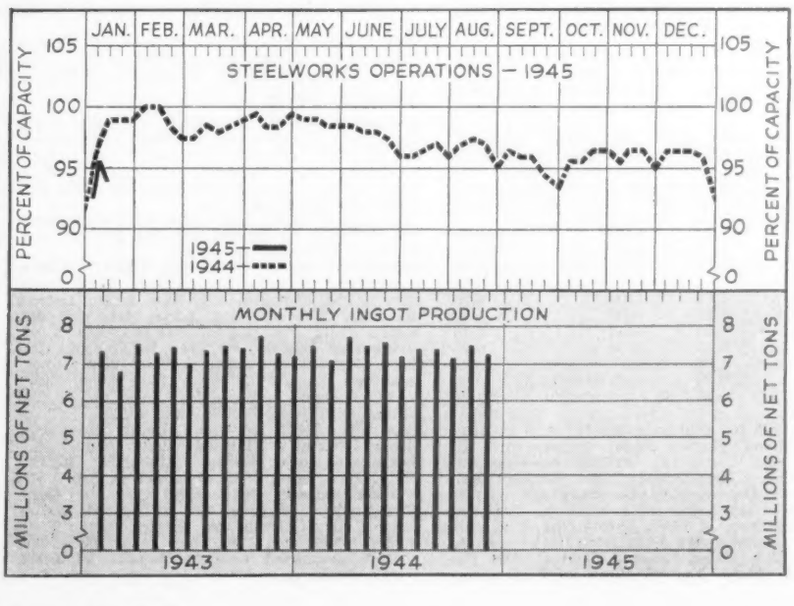
°Based on steelmaking capacities as of these dates.

Continued cold and snow over much of the industrial section of the country caused the estimated national rate of steel production to decline 1½ points to 94 per cent of capacity, though in some centers small increases were possible. Cleveland producers gained 8 points to 86 per cent, New England 5 points to 92, Cincinnati 2 points to 92, Wheeling 1 point to 98.5 and Buffalo 19 points to 70. Youngstown rate declined 9 points to 81 per cent and Chicago 1 point to 98½ per cent. Rates were unchanged as follows: St. Louis 75, Pittsburgh 89, Birmingham 95, Detroit 88, eastern Pennsylvania 95.

Scrap prices have returned to ceilings on all but a few grades in some areas, a result of heavy demand to sustain a high rate of steel production and also because of storm interference in the industrial area. Occasional allocations are resorted to where consumers are unable to obtain tonnage by regular means. Due to inability of suppliers to perform their yard work and delays in railroad transport many melters have used considerable tonnage from reserves. Better deliveries will allow these losses to be recouped. Cast scrap continues tightest of all grades, increasing use of pig iron by foundries. Threat of possible shortage later still haunts the market, though it is not regarded as imminent.

Steel ingot production in 1944 set a new record, for the fifth consecutive year, with 89,552,961 tons, compared with 88,836 tons in 1943. When new records started in 1940 production totaled 66,981,662 tons, only two-thirds of the 1944 tonnage.

For the first time since before prices were frozen by Office of Price Administration in 1941 the average composite of finished steel prices has undergone a change. Increases in price of hot-rolled sheets, plates and nails brought a rise in the composite of 82 cents, from $56.73 to $57.55. Other composites remained unchanged, semifinished steel $36, steelmaking pig iron $23.05 and steelmaking scrap $19.17.



COMPOSITE MARKET AVERAGES

	Jan., 13	Jan., 6	Dec., 30	One Month Ago Dec., 1944	Three Months Ago Oct., 1944	One Year Ago Jan., 1944	Five Years Ago Jan., 1940
Finished Steel	$57.55	$56.73	$56.73	$56.73	$56.73	$56.73	$56.73
Semifinished Steel	36.00	36.00	36.00	36.00	36.00	36.00	36.15
Steelmaking Pig Iron	23.05	23.05	23.05	23.05	23.05	23.05	22.05
Steelmaking Scrap	19.17	19.17	19.17	16.40	19.17	19.17	17.60

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; others, gross tons.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Jan. 13, 1944	Dec., 1944	Oct., 1944	Jan., 1944
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.47	2.47	2.47	2.47
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.20	2.10	2.10	2.10
Plates, Philadelphia	2.25	2.15	2.15	2.15
Plates, Chicago	2.20	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.20	2.10	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.65	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.20	2.10	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.65	3.50	3.50	3.50
Bright bess., basic wire, Pittsburgh	2.60	2.60	2.60	2.60
Tin plate, per base box, Pittsburgh	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.80	2.55	2.55	2.55

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to ⅜-inch, Pitts.	2.00	2.00	2.00	2.00

Pig Iron

	Jan. 13, 1944	Dec., 1944	Oct., 1944	Jan., 1944
Bessemer, del. Pittsburgh	$25.19	$25.19	$25.19	$25.19
Basic, Valley	23.50	23.50	23.50	23.50
Basic, eastern del. Philadelphia	25.34	25.34	25.34	25.34
No. 2 fdry., del. Pitts., N.&S. Sides	24.69	24.69	24.69	24.69
No. 2 foundry, Chicago	24.00	24.00	24.00	24.00
Southern No. 2, Birmingham	20.38	20.38	20.38	20.38
Southern No. 2 del. Cincinnati	24.30	24.30	24.30	24.30
No. 2 fdry., del. Phila.	25.84	25.84	25.84	25.84
Malleable, Valley	24.00	24.00	24.00	24.00
Malleable, Chicago	24.00	24.00	24.00	24.00
Lake Sup., charcoal, del. Chicago	37.34	37.34	37.34	37.34
Gray forge, del. Pittsburgh	24.19	24.19	24.19	24.19
Ferromanganese, del. Pittsburgh	140.33	140.33	140.33	140.33

Scrap

Heavy melting steel, No. 1 Pittsburgh	$20.00	$19.75	$16.95	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	14.50	18.75
Heavy melting steel, Chicago	18.75	18.75	17.55	18.75
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 east, Chicago	20.00	20.00	20.00	20.00

Coke

Connellsville, furnace, ovens	$7.00	$7.00	$7.00	$6.50
Connellsville, foundry ovens	7.75	7.75	7.75	7.75
Chicago, by-product fdry., del.	13.35	13.35	13.35	13.35

STEEL, IRON RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA Schedule No. 6 issued April 16, 1941, revised June 20, 1941 and Feb. 4, 1942. The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. Seconds and off-grade products are also covered. Exceptions applying to individual companies are noted in the table.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $51.00.

(Empire Sheet & Tin Plate Co., Mansfield, O., may quote carbon steel ingots at $33 gross ton, f.o.b. mill. Kaiser Co. Inc. $43, f.o.b. Pacific ports.)

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon; uncrop., $45.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $34; Detroit, del. $36; Duluth (bil) $36; Pac. Ports, (bil) $46. (Andrews Steel Co., carbon slabs $41; Continental Steel Corp., billets $34, Kokomo, to Acme Steel Co.; Northwestern Steel & Wire Co., $41, Sterling, Ill.; Laclede Steel Co. $34, Alton or Madison, Ill.; Wheeling Steel Corp. $36 base, billets for lend-lease, $34, Portsmouth, O., on slabs on WPB directives, Granite City Steel Co. $47.50 gross ton slabs from D.P.C. mill. Geneva Steel Co., Kaiser Co. Inc., $58.64, Pac. Ports).

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $40. Detroit, del. $42; Duluth, billets, $42; forg. bil. f.o.b. Pac. Ports, $52.

(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points; Follansbee Steel Corp., $49.50 f.o.b. Toronto, O. Geneva Steel Co., Kaiser Co. Inc., $64.64, Pacific ports.)

Open Hearth Shell Steel: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Youngstown, Birmingham, base 1000 tons one size and section; 3-12 in., $52; 12-18 in., excel., $54.00; 18 in. and over $56. Add $2.00 del. Detroit; $3.00 del. Eastern Mich. (Kaiser Co. Inc., $76.64, f.o.b. Los Angeles.)

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54; del. Detroit $56, Eastern Mich. $57.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $34. (Wheeling Steel Corp. $37 on lend-lease sheet bars, $38 Portsmouth, O., on WPB directives; Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb., 1.90c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, No. 5—⅜ in. inclusive, per 100 lbs., $2. Do., over ⅜—½-in., incl., $2.15; Galveston, base, 2.25c and 2.40c, respectively. Worcester add $0.10; Pacific Ports $0.50. (Pittsburgh Steel Co., $0.20 higher.)

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3": Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, base 20 tons one size, 2.15c; Duluth, base 2.25c; Mahoning Valley 2.22½c; Detroit, del. 2.25c; Eastern Mich. 2.30c; New York del. 2.49c; Phila. del. 2.47c; Gulf Ports, dock 2.52c; Pac. ports, dock 2.80c. (Calumet Steel Division, Borg Warner Corp., and Joslyn Mfg. & Supply Co. may quote 2.35c, Chicago base; Sheffield Steel Corp., 2.75c, f.o.b. St. Louis.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.)

Hot-Rolled Alloy Bars: Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c; Detroit, del., 2.80c.

(Texas Steel Co. may use Chicago base price as maximum f.o.b. Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.10	4100 (.15-.25 Mo)	0.70
		(.20-.30 Mo)	0.75
2300	1.70	4300	1.70
2500	2.55	4600	1.20
3000	0.50	4800	2.15
3100	0.85	5100	0.35
3200	1.35	5130 or 5152	0.45
3400	3.20	6120 or 6152	0.95
4000	0.45-0.55	6145 or 6150	1.20

*Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.65c; Detroit 2.70c; Toledo 2.80c. (Keystone Drawn Steel Co. may sell outside its usual market area on Proc. Div., Treasury Dept. contracts at 2.65c, Spring City, Pa., plus freight on hot-rolled bars from Pittsburgh to Spring City. New England Drawn Steel Co. may sell outside New England on WPB directives at 2.65c, Mansfield, Mass., plus freight on hot-rolled bars from Buffalo to Mansfield.)

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c; Detroit, del. 3.45c; Eastern Mich. 3.50c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c; Pacific ports, dock 2.35c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo base 2.15c; Detroit, del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel reinforcing bars 2.33c, f.o.b. mill.)

Iron Bars: Single refined, Pitts. 4.40c; double refined 5.40c; Pittsburgh, staybolt, 5.75c; Terre Haute, single ref., 5.00c, double ref., 6.25c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown Sparrows Pt., Middletown, base 2.20c; Granite City, base 2.30c; Detroit del. 2.30c; Eastern Mich. 2.35c; Phila. del. 2.37c; New York del. 2.34c; Pacific ports 2.75c.

(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area on the Middletown, O. base.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.05c; Granite City, base 3.15c; Detroit del. 3.15c; Eastern Mich. 3.20c; New York del. 3.39c; Phila. del. 3.37c; Pacific ports 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown Sparrows Point, Middletown, base 3.65c; Granite City, base 3.75c; New York del. 3.89c; Phila. del. 3.82c; Pacific ports 4.20c.

(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.31c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage, not corrugated, copper alloy 3.60c; Granite City 3.70c; Pacific Ports 4.25c; copper iron 3.90c, pure iron 3.95c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh, 4.25c.

Enameling Sheets: 10-gage; Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base, 2.75c; Granite City, base 2.85c; Detroit, del. 2.85c; eastern, Mich. 2.90c; Pacific ports 3.40c; **20-gage;** Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 3.35c; Detroit del. 3.45c; eastern Mich. 3.50c; Pacific ports 4.00c.

Electrical Sheets No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.20c	3.95c	3.30c
Armature	3.55c	4.30c	3.65c
Electrical	4.05c	4.80c	4.15c
Motor	4.95c	5.70c	5.05c
Dynamo	5.65c	6.40c	5.75c
Transformer			
72	6.15c	6.90c	.....
65	7.15c	7.90c	.....
58	7.65c	8.40c	.....
52	8.45c	9.20c	.....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.20c; Eastern Mich. 2.25c; Pacific ports 2.75c. (Joslyn Mfg. Co. may quote 2.30c, Chicago base.)

Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.90c; Eastern Mich. 2.95c; Worcester base 3.00c.

Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Chicago 3.05c; Detroit del. 3.05c; Eastern Mich. 3.10c; Worcester base 3.35c.

Cold-Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.30c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb. base box, $5.00; Granite City $5.10.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb. base box, 0.50 lb. tin, $4.50; 0.75 lb. tin $4.65.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, 3.15c; Pacific ports, boxed 4.05c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c; Pacific ports 4.55c.

Manufacturing Ternes: (Special Coated) Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City $4.40.

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I.C. 8-lb. $12.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16; 30-lb. $17.25; 40-lb. $19.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown Sparrows Point, Coatesville, Claymont, 2.20c; New York, del. 2.39c; Phila., del. 2.25c; St. Louis, 2.44c; Boston, del. 2.52-77c; Pacific ports, 2.75c; Gulf Ports, 2.55c.

(Granite City Steel Co. may quote carbon plates 2.35c f.o.b. mill; 2.65c f.o.b. D.P.C. mill; Kaiser Co. Inc., 3.20c, f.o.b. Los Angeles. Central Iron & Steel Co. 2.50c f.o.b. basing points; Geneva Steel Co., Provo, Utah, 3.20c, f.o.b. Pac. ports.)

Floor Plates: Pittsburgh, Chicago, 3.35c; Pacific ports, 4.00c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c; Gulf ports 3.95c; Pacific ports 4.15c.

Wrought Iron Plates: Pittsburgh, 3.80c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del. 2.27c; Phila., del. 2.215c; Pacific ports, 2.75c.

(Phoenix Iron Co., Phoenixville, Pa., may quote carbon steel shapes at 2.35c at established basing points and 2.50c, Phoenixville, for export; Sheffield Steel Corp., 2.55c f.o.b. St. Louis. Geneva Steel Co., 3.25c, Pac. ports); Kaiser Co. Inc., 3.20c f.o.b. Los Angeles.)

Steel Sheet Piling: Pittsburgh, Chicago, Buffalo, 2.40c.

Wire Products, Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham (except spring wire) to manufacturers in carloads (add $2 for Worcester, $1 for Duluth).

Bright basic, bessemer wire 2.60c
Spring wire 3.20c
(Pittsburgh Steel Co., 0.20c higher.)

Wire Products to the Trade:

Standard and Cement-coated wire nails, and staples, 100-lb. keg, Pittsburgh, Chicago, Birmingham, Cleveland, Duluth $2.80; Pacific ports 3.30c
Annealed fence wire, 100-lb., Pittsburgh, Chicago, Cleveland 3.05c
Galvanized fence wire, 100 lb., Pittsburgh, Chicago, Cleveland 3.40c
Woven fence, 15½ gage and heavier, per base column ..... .67c
Barbed wire, 80-rod spool, Pittsburgh, Chicago, Cleveland, Birmingham, column 70; twisted barbless wire, column 70.

Tubular Goods

Welded Pipe: Base price in carloads, threaded and coupled to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Weld

Steel In.	Blk.	Galv.	Iron In.	Blk.	Galv.
⅛	56	33	¼	24	3½
¼ & ⅜	59	40½	⅜	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

Lap Weld

Steel In.	Blk.	Galv.	Iron In.	Blk.	Galv.
2	61	49½	1¼	23	3½
2½-3	64	52½	1½	28½	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2½, 3½	31½	14½
9-19	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O.D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2¼"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.58	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	....

Rails, Supplies

Standard rails, over 60-lb., f.o.b. mill, gross ton, $43.00. Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $43.00.

•Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $31-33.

Supplies: Track bolts, 4.75c; heat treated, 5.00c. Tie plates, $43 net ton, base, Standard spikes, 3.00c.

•Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, base, cents per lb.; Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.

Tung	Chr.	Van.	Moly.	Pitts. base per lb.
18.00	4	1	...	67.00c
1.5	4	1	8.5	54.00c
...	4	2	8	54.00c
5.50	4	1.50	4	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.—f.o.b. Pittsburgh

CHROMIUM NICKEL STEEL

Type	Bars	Plates	Sheets	H. R. Strip	C. R Strip
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	.....	.....
•316	40.00	44.00	48.00	40.00	48.00
†321	29.00	34.00	41.00	29.25	38.00
‡347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	29.00	17.50	22.50

STRAIGHT CHROMIUM STEEL

403	21.50	24.50	29.50	21.25	27.00
••410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡‡430F	19.50	22.50	29.50	18.75	24.50
440A	24.00	28.50	33.50	23.75	36.50
442	22.50	25.50	32.50	24.00	32.00
443	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00

STAINLESS CLAD STEEL (20%)

304	.....	§§18.00	19.00	.....	.....

•With 2-3% moly. †With titanium. ‡With columbium. ••Plus machining agent. ††High carbon. ‡‡Free machining. §§Includes annealing and pickling.

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

Extras mean additions or deductions from base prices in effect April 16, 1941.

Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which case nearest basing point price, plus all-rail freight may be charged.

Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. **Governing basing point** is basing point nearest the consumer providing the lowest delivered price.

Seconds, maximum prices: flat-rolled rejects 75% of prime prices, wasters 75%, waste-wasters 65% except plates, which take waster prices; tin plate $2.80 per 100 lbs.; terne plate $2.25; semifinished 85% of primes; other grades limited to new material ceilings.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941.

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%

Carriage and Machine

½ x 6 and smaller ..... 65½ off
Do., ⅝ and ⅝ x 6-in. and shorter ..... 63½ off
Do., ⅞ to 1 x 6-in. and shorter ..... 61 off
1⅛ and larger, all lengths ..... 59 off
All diameters, over 6-in. long ..... 59 off
Tire bolts ..... 50 off
Step bolts ..... 56 off
Plow bolts ..... 65 off

Stove Bolts

In packages with nuts separate 71-10 off; with nuts attached 71 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts

Semifinished hex	U.S.S.	S.A.E.
⅞-inch and less	62	64
½-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	

Hexagon Cap Screws

Upset 1-in., smaller ..... 64 off
Milled 1-in., smaller ..... 60 off

Square Head Set Screws

Upset, 1-in., smaller ..... 71 off
Headless, ¼-in., larger ..... 60 off
No. 10, smaller ..... 70 off

Piling

Pittsburgh, Chicago, Buffalo 2.40c

Rivets, Washers

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

Structural 3.75c
⅞-inch and under ..... 65-5 off
Wrought Washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l. ... $2.75-3.00 off

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace ..... •7.00
Connellsville, foundry 7.50- 8.00
Connellsville, prem. fdry. 7.75- 8.10
New River, foundry 8.50- 8.75
Wise county, foundry 7.25- 7.75

By-Product Foundry

Wise county, furnace 6.75- 7.25
Kearney, N. J., ovens 12.65
Chicago, outside delivered 12.60
Chicago, delivered 13.35
Terre Haute, delivered 13.10
Milwaukee, ovens 13.35
New England, delivered 14.25
St. Louis, delivered ..... †13.35
Birmingham, delivered 10.50
Indianapolis, delivered 13.10
Cincinnati, delivered 12.85
Cleveland, delivered 12.80
Buffalo, delivered 13.00
Detroit, delivered 13.35
Philadelphia, delivered 12.88

•Operators of hand-drawn ovens using trucked coal may charge $7.75, effective Nov. 29, 1943.
†13.85 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol 15.00c
Toluol, two degree 28.00c
Solvent naphtha 27.00c
Industrial xylol 27.00c

Per lb. f.o.b. works

Phenol (car lots, returnable drums) 12.50c
Do., less than car lots 13.25c
Do., tank cars 11.50c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls., to jobbers 8.00c

Per ton, bulk, f.o.b. port

Sulphate of ammonia $29.20

WAREHOUSE STEEL PRICES

Base delivered price, cents per pound, for delivery within switching limits, subject to established extras.

	Hot rolled bars	Structural shapes	Plates	Floor plates	Hot rolled sheets (10 gage base)	Hot rolled bands (12 gage and heavier)	Hot rolled hoops (14 gage and lighter)	Galvanized flat sheets (24 gage base)	Cold-rolled sheets (17 gage base)	Cold finished bars	Cold-rolled strip	NE hot bars 8600 series	NE hot bars 9400 series
Boston	4.044[1]	3.912[1]	3.912[1]	5.727[1]	3.774[1]	4.106[1]	5.106[1]	5.234[14]	4.744[14]	4.144[21]	4.715	6.012[23]	6.012[23]
New York	3.853[1]	3.758[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[23]	4.618[14]	4.108[24]	4.774	.....	.....
Jersey City	3.853[1]	3.747[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[23]	4.618[14]	4.108[24]	4.774	.....	.....
Philadelphia	3.829[1]	3.666[1]	3.605[1]	5.272[1]	3.518[1]	3.922[1]	4.272[1]	5.018[23]	4.872[23]	4.072[23]	4.771	5.816[23]	5.866[23]
Baltimore	3.809[1]	3.759[1]	3.594[1]	5.252[1]	3.594[1]	3.902[1]	4.252[1]	4.894[1]	4.852[23]	4.052[23]	.....	.....	.....
Washington	3.941[1]	3.960[1]	3.796[1]	5.941[1]	3.596[1]	4.041[1]	4.391[1]	5.196[23]	4.841[23]	4.041[23]	.....	.....	.....
Norfolk, Va.	4.065[1]	4.002[1]	3.971[1]	5.465[1]	3.771[1]	4.165[1]	4.515[1]	5.371[23]	4.965[24]	4.165[23]	.....	.....	.....
Bethlehem, Pa.*	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Claymont, Del.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Coatesville, Pa.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Buffalo (city)	3.85[1]	3.40[1]	3.65[1]	5.26[1]	3.85[1]	3.819[1]	3.819[1]	4.75[15]	4.40[15]	3.75[24]	4.669	5.60[23]	5.75[23]
Buffalo (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.81[1]	3.50[1]	4.65[15]	4.30[15]	3.65[24]	4.35	5.60[23]	5.75[23]
Pittsburgh (city)	3.85[1]	3.40[1]	3.40[1]	5.00[1]	3.85[1]	3.60[1]	3.60[1]	4.75[15]	4.40[24]	3.75[24]	.....	.....	.....
Pittsburgh (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.50[1]	3.50[1]	4.65[15]	4.30[24]	3.65[24]	.....	.....	.....
Cleveland (city)	3.85[1]	3.588[1]	3.40[1]	5.188[1]	3.85[1]	3.60[1]	3.60[1]	4.877[15]	4.40[24]	3.75[24]	4.45[24]	5.60[23]	5.65[23]
Cleveland (country)	3.25[1]	.....	3.30[1]	.....	3.25[1]	3.50[1]	3.50[1]	.....	4.30[24]	3.65[24]	4.35[24]	.....	.....
Detroit	3.450[1]	3.661[1]	3.609[1]	5.281[1]	3.450[1]	3.700[1]	3.700[1]	5.000[23]	4.500[24]	3.800[23]	4.659	5.98[23]	5.98[23]
Omaha (city, delivered)	4.115[1]	4.165[1]	4.165[1]	5.765[1]	3.865[1]	4.215[1]	4.215[1]	5.608[23]	5.448[24]	4.448[24]	.....	.....	.....
Omaha (country, base)	4.015[1]	4.065[1]	4.065[1]	5.665[1]	3.765[1]	4.115[1]	4.115[1]	5.508[23]	.....	.....	.....	.....	.....
Cincinnati	3.611[1]	3.391[1]	3.661[1]	5.291[1]	3.425[1]	3.675[1]	3.675[1]	4.825[15]	4.475[24]	4.011[24]	4.711	6.10	6.20
Youngstown, O.*	.....	.....	.....	.....	.....	.....	.....	4.40[15]	.....	.....	.....	.....	.....
Middletown, O.*	.....	.....	.....	.....	3.25[1]	3.50[1]	3.50[1]	4.65[24]	.....	.....	.....	.....	.....
Chicago (city)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.25[1]	3.60[1]	3.60[1]	5.231[23]	4.20[24]	3.75[24]	4.65	5.75[23]	5.85[23]
Milwaukee	3.687[1]	3.687[1]	3.687[1]	5.287[1]	3.887[1]	3.787[1]	3.787[1]	5.372[23]	4.337[24]	3.887[23]	4.787	5.987[23]	6.087[23]
Indianapolis	3.58[1]	3.68[1]	3.68[1]	5.23[1]	3.518[1]	3.768[1]	3.768[1]	4.918[15]	4.568[24]	3.93[24]	4.78	6.08[23]	6.18[23]
St. Paul	3.76[3]	3.81[3]	3.81[3]	5.41[3]	3.51[3]	3.86[3]	3.86[3]	5.257[15]	4.46[24]	4.361[24]	5.102	6.09[23]	6.19[23]
St. Louis	3.647[1]	3.697[1]	3.697[1]	5.297[1]	3.397[1]	3.747[1]	3.747[1]	5.172[23]	4.347[24]	4.081[21]	4.981	6.181[23]	6.281[23]
Memphis, Tenn.	4.015[5]	4.065[5]	4.065[5]	5.78[5]	3.965[5]	4.215[5]	4.215[5]	5.265[15]	4.78[24]	4.33[21]	.....	.....	.....
Birmingham	3.50[1]	3.55[1]	3.55[1]	5.903[1]	3.45[1]	3.70[1]	3.70[1]	4.75[15]	4.852[24]	4.54	5.215	.....	.....
New Orleans (city)	4.10[4]	3.90[4]	3.90[4]	5.85[4]	4.058[4]	4.20[4]	4.20[4]	5.25[23]	5.079[24]	4.60[23]	5.429	.....	.....
Houston, Tex.	3.75[3]	4.25[3]	4.25[3]	5.50[3]	3.768[3]	4.318[3]	4.318[3]	5.318[23]	4.10[15]	3.65[22]	.....	.....	.....
Los Angeles	4.40[4]	4.65[4]	4.95[4]	7.20[4]	5.00[4]	4.95[4]	6.75[4]	6.00[15]	7.20[4]	5.583[23]	5.618	5.85[23]	5.95[23]
San Francisco	4.15[7]	4.35[7]	4.65[7]	6.35[7]	4.55[7]	4.50[7]	5.75[7]	6.35[15]	7.30[23]	5.333[24]	7.333	8.304[23]	8.404[23]
Portland, Oreg.	4.45[27]	4.45[27]	4.75[27]	6.50[27]	4.65[27]	4.75[27]	6.30[27]	5.75[15]	6.60[15]	5.583[15]	.....	.....	.....
Tacoma	4.35[4]	4.45[4]	4.75[4]	6.50[4]	4.65[4]	4.25[4]	5.45[4]	5.95[15]	7.60[15]	5.783[22]	.....	.....	8.00[23]
Seattle	4.35[4]	4.45[4]	4.75[4]	6.50[4]	4.65[4]	4.25[4]	5.45[4]	5.95[15]	7.05[15]	5.783[22]	.....	.....	8.00[23]

*Basing point cities with quotations representing mill prices, plus warehouse spread.

NOTE—All prices fixed by Office of Price Administration in Amendments Nos. 10 to 18 to Revised Price Schedule No. 49. Deliveries outside above cities computed in accordance with regulations.

BASE QUANTITIES

[1]—400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—800 to 1999 pounds; [5]—400 to 8999 pounds; [6]—800 to 9999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundles; [18]—one to six bundles; [20]—100 to 749 pounds; [22]—800 to 1999 pounds; [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 to 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pounds; [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, base; [27]—300 to 4999 pounds.

Ores

Lake Superior Iron Ore
Gross ton, 51½% (Natural) Lower Lake Ports

Old range bessemer	$4.75
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore
Cents, units, del. E. Pa.

Foundry and basic 56-63% contract	13.00

Foreign Ore
Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00

Tungsten Ore

Chinese wolframite, per short ton unit, duty paid	$24.00

Chrome Ore
(Equivalent OPA schedules):
Gross ton f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Ore., or Tacoma, Wash.
(S/S paying for discharging; dry basis; subject to penalties if guarantees are not met.)

Indian and African	
48% 2.8:1	$41.00
48% 3:1	43.50
48% no ratio	31.00
South African (Transvaal)	
44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80
Brazilian—nominal	
44% 2.5:1 lump	33.65
48% 3:1 lump	43.50
Rhodesian	
45% no ratio	28.80
48% no ratio	31.00
48% 3:1 lump	43.50
Domestic (seller's nearest rail)	
48% 3:1	52.80
less $7 freight allowance	

Manganese Ore

Sales prices of Metals Reserve Co., cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85.0c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91.0c; prices include duty on imported ore and are subject to premiums, penalties and other provisions of amended M.P.R. No. 248, effective as of May 15. Price at basing points which are also points of discharge of imported manganese ore is f.o.b. cars, shipside, at dock most favorable to the buyer.

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Designation	Chemical Composition Limits, Per Cent — Carbon	Mn.	Si.	Cr.	Ni.	Mo.	Basic open-hearth Bars per 100 lb.	Basic open-hearth Billets per GT	Electric furnace Bars per 100 lb.	Electric furnace Billets per GT
NE 1330	.28-.33	1.60-1.90	.20-.35	.....	.....	.....	$ .10	$ 2.00	.....	.....
NE 8618	.13-.17	.70- .90	.20-.35	.40-.60	.40-.70	.15-.25	.65	13.00	1.15	23.00
NE 8720	.18-.23	.70- .90	.20-.35	.40-.60	.40-.70	.20-.30	.70	14.00	1.20	24.00
NE 9255	.50-.60	.70- .95	1.80-2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9261	.55-.65	.70-1.00	1.80-2.20	.10-.25	.....	.....	.65	13.00	.....	.....
NE 9262	.55-.65	.70-1.00	1.80-2.20	.25-.40	.....	.....	.65	13.00	.....	.....
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9425	.23-.28	.90-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.80	16.00	1.30	26.00

Extras are in addition to a base price of 2.70c, per pound on finished products and $54 per gross ton on semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices quoted on vanadium alloy.

Pig Iron

Prices (in gross tons) are maximums fixed by OPA Price Schedule No. 10, effective June 10, 1941. Exceptions indicated in footnotes. Allocation regulations from WPB Order M-17, expiring Dec. 31, 1942. Base prices bold face, delivered light face. Federal tax on freight charges, effective Dec. 1, 1942, not included in following prices.

	Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$25.00	$24.50	$26.00	$25.50
Newark, N. J., del.	26.53	26.03	27.53	27.03
Brooklyn, N. Y., del.	27.50	.....	.....	28.00
Birdsboro, Pa., base	25.00	24.50	26.00	25.50
Birmingham, base	†20.38	†19.00	25.00	.....
Baltimore, del.	25.61	.....	.....	.....
Boston, del.	25.12	.....	.....	.....
Chicago, del.	24.22	.....	.....	.....
Cincinnati, del.	24.06	22.68	.....	.....
Cleveland, del.	24.12	23.24	.....	.....
Newark, N. J., del.	26.15	.....	.....	.....
Philadelphia, del.	25.46	24.58	.....	.....
St. Louis, del.	24.12	23.24	.....	.....
Buffalo, base	24.00	23.00	25.00	24.50
Boston, del.	25.50	25.00	26.50	26.00
Rochester, del.	25.53	.....	26.53	26.03
Syracuse, del.	26.08	.....	27.08	26.58
Chicago, base	24.00	23.50	24.50	24.00
Milwaukee, del.	25.10	24.60	25.60	25.10
Muskegon, Mich., del.	27.19	.....	.....	27.19
Cleveland, base	24.00	23.50	24.50	24.00
Akron, Canton, O., del.	25.39	24.89	25.89	25.39
Detroit, base	24.00	23.50	24.50	24.00
Saginaw, Mich., del	26.31	25.81	26.81	26.31
Duluth, base	24.50	24.00	25.00	24.50
St. Paul, del.	26.63	26.13	27.13	26.63
Erie, Pa., base	24.00	23.50	25.00	24.50
Everett, Mass., base	25.00	24.50	26.00	25.50
Boston, del.	25.50	25.00	26.50	26.00
Granite City, Ill., base	24.00	23.50	24.50	24.00
St. Louis, del.	24.50	24.00	.....	24.50
Hamilton, O., base	24.00	23.50	.....	24.00
Cincinnati, del.	24.44	24.61	.....	25.11
Neville Island, Pa., base	24.00	23.50	24.50	24.00
§Pittsburgh, del. No. & So. sides	24.69	24.19	25.19	24.69
Provo, Utah, base	22.00	21.50	.....	.....
Sharpsville, Pa., base	24.00	23.50	24.50	24.00
Sparrows Point, base	25.00	24.50	.....	.....
Baltimore, del.	25.99	.....	.....	.....
Steelton, Pa., base	.....	24.50	.....	25.50
Swedeland, Pa., base	25.00	24.50	26.00	25.50
Philadelphia, del.	25.84	25.34	.....	26.34
Toledo, O., base	24.00	23.50	24.50	24.00
Youngstown, O., base	24.00	23.50	24.50	24.00
Mansfield, O., del.	25.94	25.44	25.44	25.94

Base grade, silicon 1.75-2.25%; add 50 cents for each additional 0.25% silicon, or portion thereof; deduct 50 cents for silicon below 1.75% on foundry iron. †For phosphorus 0.70% or over deduct 38 cents. §For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenridge 1.24.

Note: Add 50 cents per ton for each 0.50% manganese or portion thereof over 1.00%.

Nickel differentials: Under 0.50%, no extra; 0.50% to 0.74% incl., $2 per ton; for each additional 0.25% nickel, $1 per ton.

High Silicon, Silvery

5.00-6.50 per cent (base).....$29.50

6.51-7.00	$30.50	9.01- 9.50	$35.50
7.01-7.50	31.50	9.51-10.00	36.50
7.51-8.00	32.50	10.01-10.50	37.50
8.01-8.50	33.50	10.51-11.00	38.50
8.51-9.00	34.50	11.01-11.50	39.50

F.o.b. Jackson county, O., per gross ton, Buffalo base prices are $1.25 higher. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton (For higher silicon irons a differential over and above the price of base grades is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Charcoal Pig Iron

Northern

Lake Superior Furn. $34.00
Chicago, del. 37.34

Southern

Semi-cold blast, high phos., f.o.b. furnace, Lyles, Tenn. $28.50
Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn. 33.00

Gray Forge

Neville Island, Pa. $23.50
Valley base 23.50

Low Phosphorus

Basing points: Birdsboro, Pa., $29.50; Steelton, Pa., and Buffalo, N. Y., $29.50 base; $30.74, del., Philadelphia. Intermediate phos., Central Furnace, Cleveland, $26.50.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorus Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorus content of 0.70% and over.

Manganese Differentials: Basing point prices subject to an additional charge not to exceed 50 cents a ton for each 0.50% manganese content in excess of 1.00%.

Ceiling Prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Pittsburgh Coke & Iron Co., (Sharpsville, Pa. furnace only) and Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic Bessemer and Malleable. Mystic Iron Works, Everett, Mass., may exceed basing point prices by $2 per ton, effective May 20, 1943. Chester, Pa., furnace of Pittsburgh Coke & Iron Co. may exceed basing point prices by $2.25 per ton, effective July 27, 1942. E. & G. Brooke Co., Birdsboro, Pa., allowed $1 above basing point.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky. $64.00

First Quality

Pa., Ill., Md., Mo., Ky.	51.30
Alabama, Georgia	51.30
New Jersey	56.00
Ohio	43.00

Second Quality

Pa., Ill., Md., Mo., Ky.	46.50
Alabama, Georgia	38.00
New Jersey	49.00
Ohio	36.00

Malleable Bung Brick

All bases $59.80

Silica Brick

Pennsylvania	$51.30
Joliet, E. Chicago	58.90
Birmingham, Ala.	51.30

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$31.00
Wire cut	29.00

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Metallurgical grade, f.o.b. Ill., Ky., net ton, carloads CaF_2 content, 70% or more, $33; 65 but less than 70%, $32; 60 but less than 65% $31; less than 60%, $30. (After Aug. 29 base price any grade $30.)

Ferroalloy Prices

Ferromanganese (standard) 78-82% c.l. gross ton, duty paid, eastern, central and western zones, $135; add $6 for packed c.l., $10 for ton, $13.50 less-ton; f.o.b. cars, New Orleans, $1.70 for each 1%, or fraction contained manganese over 82% or under 78%; delivered Pittsburgh, $140.33.

Ferromanganese (Low and Medium Carbon); per lb. contained manganese; eastern zone, low carbon, bulk, c.l., 23c 2000 lb. to c.l., 23.40c; medium, 14.50c and 15.20c; central, low carbon, bulk, c.l., 23.30c; 2000 lb. to c.l., 24.40c; medium, 14.80c and 16.20c; western, low carbon, bulk, c.l., 24.50c, 2000 lb. to c.l., 25.40c; medium, 15.75c and 17.20c; f.o.b. shipping point, freight allowed.

Spiegeleisen: 19-21% carlots per gross ton, Palmerton, Pa. $36; 16-19%, $35.

Electrolytic Manganese: 99.9% plus, less ton lots, per lb. 37.6 cents.

Chromium Metal: 97% min. chromium, max. .50% carbon, eastern zone, per lb. contained chromium bulk, c.l., 79.50c, 2000 lb. to c.l. 80c; central, 81c and 82.50c; western, 82.25c and 84.75c; f.o.b. shipping point, freight allowed.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, R.R. freight allowed, eastern zone, $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: High carbon, eastern zone, bulk, c.l., 13c, 2000 lb. to c.l., 13.90c; central, add .40c and .65c; western, add 1c and 1.85c—high nitrogen, high carbon ferrochrome: Add 5c to all high carbon ferrochrome prices; all zones; low carbon eastern, bulk, c.l., max. 0.06% carbon, 23c, 0.10% 22.50c, 0.15% 22c, 0.20% 21.50c, 0.50% 21c, 1.00% 20.50c, 2.00% 19.50c; 2000 lb. to c.l., 0.06% 24c, 0.10% 23.50c, 0.15% 23c, 0.20% 22.50c, 0.50% 22c, 1.00% 21.50c, 2.00% 20.50c; central, add .4c for bulk, c.l. and .65c for 2000 lb. to c.l.; western, add 1c for bulk, c.l. and 1.85c for 2000 lb. to c.l.; carload packed differential .45c; f.o.b. shipping point, freight allowed. Prices per lb. contained Cr high nitrogen, low carbon ferrochrome: Add 2c to low carbon ferrochrome prices; all zones. For higher nitrogen carbon add 2c for each .25% of nitrogen over 0.75%.

Special Foundry ferrochrome: (Chrom. 62-66%, car. approx. 5-7%) Contract, carload, bulk, 13.50c, packed 13.95c, ton lots 14.40c, less, 14.90c, eastern, freight allowed, per pound contained chromium; 13.90c, 14.35c, 15.05c and 15.55c central; 14.50c, 14.95c, 16.25c and 16.75c, western; spot up .25c.

S.M. Ferrochrome, high carbon: (Chrom. 60-65%, sil. 4-6%, mang. 4-6% and carbon 4-6%.) Contract, carlot, bulk, 14.00c, packed, 14.45c, ton lots 14.90c, less 15.40c, eastern, freight allowed; 14.40c, 14.85c, 15.55c and 16.05c, central; 15.00c, 15.45c, 16.75c and 17.25c, western; spot up .25c; per pound contained chromium.

S.M. Ferrochrome, low carbon: (Chrom. 62-66%, sil. 4-6%, mang. 7%) Contract, carload, bulk 13.50c, 4-6% and carbon 1.25% max.) Contract, carlot, bulk, 20.00c, packed 20.45c, ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained chromium; 20.40c 20.85c, 21.65c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up .25c.

SMZ Alloy: (Silicon 60-65%, Mang. 5-7%, zir. 5-7% and iron approx 20%) per lb. of alloy. Contract carlots 11.50c, ton lots 12.00c, less 12.50c, eastern zone, freight allowed; 12.00c. 12.85c and 13.35c central zone; 14.05c, 14.60c and 15.10c, western; spot up .25c.

Silcaz Alloy: (Sil. 35-40%, cal. 9-11%, alum. 6-8%, Zir. 3-5%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy. Contract, carlots 25.00c, ton lots 26.00c, less ton lots 27.00c, eastern, freight allowed; 25.50c, 26.75c and 27.75c, central; 27.50c, 28.90c and 29.90c, western; spot up .25c.

Silvaz Alloy: (Sil. 35-40% van. 9-11%, alum. 5-7%, zir. 5-7%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy. Contract, carlots 58.00c, ton lots 59.00c, less 60.00c, eastern, freight allowed; 58.50c, 59.75c and 60.75c, central; 60.50c, 61.90c and 62.90c, western; spot up ¼c.

CMSZ Alloy 4: (Chr. 45-49%, mang. 4-6%, sil. 18-21%, zir. 1.25-1.75%, and car. 3.00-4.50%). Contract, carlots, bulk, 11.00c and packed 11.50c; ton lots 12.00c; less 12.50c, eastern, freight allowed; 11.50c and 12.00c, 12.75c, 13.25c, central; 13.50c and 14.00c, 14.75c, 15.25c, western; spot up .25c.

CMSZ Alloy 5: (Chr. 50-56%, mang. 4-6%, sil. 13.50-16.00%, zir. .75-1.25%, car. 3.50-5.00%) per lb. of alloy. Contract, carlots, bulk, 10.75c, packed 11.25c, ton lots 11.75c, less 12.25c, eastern, freight allowed; 11.25c, 11.75c and 12.50c, central; 13.25c and 13.75c, 14.50c and 15.00c, western, spot up .25c.

Ferro-Boron: (Bor. 17.50% min., sil. 1.50% max., alum. 0.50% max. and car. 0.50% Max.) per lb. of alloy. Contract ton lots, $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Manganese-Boron: (Mang. 75% approx., boron 15-20%, iron 5% max., sil. 1.50% max. and carbon 3% max.), per lb. of alloy. Contract, ton lots, $1.89, less, $2.01, eastern, freight allowed; $1.903 and $2.029 central, $1.935 and $2.055 western, spot up 5c.

Nickel-Boron: (Bor. 15-18%, alum. 1% max., sil. 1.50% max., car. 0.50% max., iron 3% max., nickel balance), per lb. of alloy. Contract, 5 tons or more, $1.90, 1 ton to 5 tons, $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Chromium-Copper: (Chrom. 8-11% cu. 88-90%, iron 1% max., sil. 0.50% max.) contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate, to which equivalent of St. Louis rate will be allowed; spot, up 2c.

Vanadium Oxide: (Fused: Vanadium oxide 85-88%, sodium oxide, approx. 10% and calcium oxide approx. 2%, or Red Cake: Vanadium oxide 85% approx., sodium oxide, approx. 9% and water approx

2.5%) Contract, any quantity, $1.10 eastern, freight allowed, per pound vanadium oxide contained; contract, carlots, $1.105, less carlots, $1.108, central; $1.118 and $1.133, western; spot add 5c to contracts in all cases.

Calcium metal; cast: Contract, ton lots or more $1.80, less, $2.30. **eastern zone,** freight allowed, per pound of metal; $1.809 and $2.309, Central, $1.849 and $2.349, western; spot up 5c.

Calcium-Manganese-Silicon: (Cal. 16-20%, mang. 14-18% and sil. 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up .25c.

Calcium-Silicon: (Cal. 30-35%, sil. 60-65% and iron 3.00% max.), per lb. of alloy. Contract, carlot, lump 13.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up .25c.

Briquets, Ferromanganese: (Weight approx. 3 lbs. and containing exactly 2 lbs. mang.), per lb. of briquets. Contract, carlots, bulk .0605c, packed .063c, tons .0655c, less .068c, eastern, freight allowed; .063c, .0655c, .0755c and .078c, central; .066c, .0685c, .0855c and .088c, western; spot up .25c.

Briquets: Ferrochrome, containing exactly 2 lb. cr., eastern zone, bulk, c.l., 8.25c per lb. of briquets, 2000 lb. to c.l., 8.75c; central, add .3c for c.l. and .5c for 2000 lb. to c.l.; western, add .70c for c.l., and .2c for 2000 lb. to c.l.; **silicomanganese,** eastern, containing exactly 2 lb. manganese and approx. ½ lb. silicon, bulk, c.l., 5.80c, 2000 lbs. to c.l., 6.30c; central, add .25c for c.l. and 1c for 2000 lb. to c.l.; western, add .5c for c.l., and 2c for 2000 lb. to c.l.; **ferrosilicon,** eastern, approx. 5 lb., containing exactly 2 lb. silicon, or weighing approx. 2½ lb. and containing exactly 1 lb. of silicon, bulk, c.l., 3.35c, 2000 lb. to c.l., 3.80c; central, add 1.50c for c.l., and .40c for 2000 lb. to c.l.; western, add 3.0c for c.l. and .45c for 2000 to c.l.; f.o.b. shipping point, freight allowed.

Ferromolybdenum: 55-75% per lb. contained molybdenum, f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Eastern zone, 90-95%, bulk, c.l., 11.05c, 2000 lb. to c.l., 12.30c; 80-90%, bulk c.l., 8.90c, 2000 lb. to c.l., 9.95c; 75%, bulk, c.l., 8.05c, 2000 lb. to c.l., 9.05c; 50%, bulk c.l., 6.65c and 2000 lb. to c.l., 7.85c; central 90-95%, bulk, c.l., 11.20c, 2000 lb. to c.l., 12.80c; 80-90%, bulk, c.l., 9.05c, 2000 to c.l., 10.45c; 75%, bulk, c.l., 8.20c, 2000 lb. to c.l., 9.65c; 50% bulk, c.l., 7.10c, 2000 lb. to c.l., 9.70c; western, 90-95%, bulk, c.l., 11.65c, 2000 lb. to c.l., 15.60c; 80-90%, bulk, c.l., 9.55c, 2000 lb. to c.l., 13.50c; 75%, bulk, c.l., 8.75c, 2000 to c.l., 13.10c; 50%, bulk, c.l., 7.25c, 2000 to c.l., 8.75c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Silicon Metal: Min. 97% silicon and max. 1% iron, eastern zone, bulk, c.l., 12.90c, 2000 lb. to c.l., 13.45c; central, 13.20c and 13.90c; western, 13.85c and 16.80c; min. 96% silicon and max. 2% iron, eastern, bulk, c.l., 12.50c, 2000 lb. to c.l., 13.10c; central, 12.80c and 13.55c; western, 13.45c and 16.50c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Manganese Metal: (96 to 98% manganese, max. 2% iron), per lb. of metal, eastern zone, bulk, c.l., 36c, 2000 lb. to c.l., 38c, central, 36.25c, and 39c; western, 36.55c and 41.05c; 95 to 97% manganese, max. 2.50% iron, eastern, bulk, c.l., 34c; 2000 c.l., 35c; central, 34.25c and 36c; western, 34.55c and 38.05c; f.o.b. shipping point, freight allowed.

Ferrotungsten: Carlots, per lb. contained tungsten, $1.90.

Tungsten Metal Powder: 98-99% per lb. any quantity $2.55-2.65.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb. contained titanium; ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5 cents per lb.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40; eastern. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20% contract basis, per gross ton, f.o.b. Niagara Falls, N. Y., freight allowed to destination east of Mississippi River and North of Baltimore and St. Louis, 6-8% carbon $142.50; 3-5% carbon $157.50.

Carbortam: Boron 0.90 to 1.15%, net ton to carload, 8c lb. F.O.B. Suspension Bridge, N. Y., frt. allowed same as high-carbon ferrotitanium.

Bortam: Boron 1.5-1.9%, ton lots 45c lb., less ton lots 50c lb.

Ferrovanadium: 35-55%, contract basis, per lb. contained vanadium, f.o.b. producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Zirconium Alloys: 12-15%, per lb. of alloy, eastern, contract, carlots, bulk, 4.60c, packed 4.80c, ton lots 4.80c, less tons 5c, carloads bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot ¼c per ton higher.

Zirconium Alloy: 35-40%, Eastern, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼-cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) contract basis f.o.b. Niagara Falls, N. Y., per lb. 5.75; ton lots 6.50c. Spot ½ cent higher.

Simanal: (Approx. 20% each silicon, manganese, aluminum) Contract basis, freight allowed, per lb. of alloy; carlots 8.75c; ton lots 9.25c, less ton lots, 9.75c.

Boresil: 3 to 4% boron, 40 to 45% Si., $6.25 lb. cont. Bo., f.o.b. Philo O., freight not exceeding St. Louis rate allowed.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Following prices are quotations developed by editors of STEEL in the various centers. For complete OPA ceiling price schedule refer to page 156 of Sept. 4, 1944, issue of STEEL.

PHILADELPHIA:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Bundles	18.75
No. 2 Bundles	18.75
No. 3 Bundles	16.75
Machine Shop Turnings	13.75
Mixed Borings, Turnings	13.75
Shoveling Turnings	15.75
No. 2 Busheling	15.50
Billet, Forge Crops	21.25
Bar Crops, Plate Scrap	21.25
Cast Steel	21.25
Punchings	21.25
Elec. Furnace Bundles	19.75
Heavy Turnings	18.25

Cast Grades

(F.o.b. Shipping Point)

Heavy Breakable Cast	16.50
Charging Box Cast	19.00
Cupola Cast	20.00
Unstripped Motor Blocks	17.50
Malleable	22.00
Chemical Borings	16.51

NEW YORK:

(Dealers' buying prices.)

No. 1 Heavy Melt. Steel	$15.33
No. 2 Heavy Melt. Steel	15.33
No. 2 Hyd. Bundles	15.33
No. 3 Hyd. Bundles	13.33
Chemical Borings	14.33
Machine Turning	10.33
Mixed Borings, Turnings	10.33
No. 1 Cupola	20.00
Charging Box	19.00
Heavy Breakable	16.50
Unstrip Motor Blocks	17.50
Stove Plate	19.00

CLEVELAND:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.50
No. 2 Heavy Melt. Steel	19.50
No. 1 Comp. Bundles	19.50
No. 2 Comp. Bundles	19.50
No. 1 Busheling	19.50
Mach. Shop Turnings	13.50-14.00
Mach. Shop Turnings	13.50-14.00
Short Shovel Turnings	15.50-16.00
Mixed Borings, Turnings	13.50-14.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	15.50
Billet, Bloom Crops	24.50
Sheet Bar Crops	22.00
Plate Scrap, Punchings	22.00
Elec. Furnace Bundles	20.50

BOSTON:

(F.o.b. shipping points)

No. 1 Heavy Melt. Steel	$14.06*
No. 2 Heavy Melt. Steel	14.06*
No. 1 Bundles	14.06*
No. 2 Bundles	14.06*
No. 1 Busheling	14.06*
Machine Shop Turnings	9.06
Mixed Borings, Turnings	9.06
Short Shovel, Turnings	11.06
Chemical Borings	14.80
Low Phos. Clippings	16.56
No. 1 Cast	20.00
Clean Auto Cast	20.00
Stove Plate	19.00
Heavy Breakable Cast	16.50

*Inland base ceiling; at ports switching district price 99 cents, Boston, to $1.09, Providence, higher.

PITTSBURGH:

(Delivered consumer's plant)

Railroad Heavy Melting	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 2 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
No. 2 Comp. Bundles	20.00
Mach. Shop Turnings	15.00
Short Shovel, Turnings	17.00
Mixed Borings, Turnings	15.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	16.00
Billet, Bloom Crops	25
Sheet Bar Crops	22.50
Plate Scrap, Punchings	22.50
Railroad Specialties	24.50
Scrap Rail	21.50
Axles	26.00
Rail 3 ft. and under	23.50
Railroad Malleable	21.00

VALLEY:

(Delivered consumer's plant)

No. 1 R.R. Hvy. Melt.	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
Short Shovel Turnings	17.00
Cast Iron Borings	16.00
Machine Shop Turnings	15.00
Low Phos. Plate	21.00-22.00

MANSFIELD, O.:

(Delivered consumer's plant)

Machine Shop Turnings	11.00

BIRMINGHAM:

(Delivered consumer's plant)

Billet, Forge Crops	$22.00
Structural, Plate Scrap	19.00
Scrap Rails, Random	18.50
Rerolling Rails	20.50
Angle, Splice Bars	20.50
Solid Steel Axles	24.00
Cupola Cast	20.00
Stove Plate	19.00
Long Turnings	8.50- 9.00
Cast Iron Borings	8.50- 9.00
Iron Car Wheels	16.50-17.00

CHICAGO:

(Delivered consumer's plant)

No. 1 R.R. Hvy. Melt.	$19.75
No. 1 Heavy Melt. Steel	18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Ind. Bundles	18.75
No. 2 Dlr. Bundles	18.75
No. 3 Galv. Bundles	16.75
Machine Turnings	12.50-13.00
Mix. Borings, Sht. Turn.	13.00-13.50
Short Shovel Turnings	13.50-14.00
Cast Iron Borings	12.50-13.00
Scrap Rails	20.25
Cut Rails, 3 feet	22.25
Cut Rails, 18-inch	23.50
Angles, Splice Bars	22.25
Plate Scrap, Punchings	21.25
Railroad Specialties	22.75
No. 1 Cast	20.00
R.R. Malleable	22.00

(Cast grades f.o.b. shipping point, railroad grades f.o.b. tracks)

BUFFALO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.25
No. 2 Heavy Melt. Steel	19.25
No. 1 Bundles	19.25
No. 2 Bundles	19.25
No. 1 Busheling	19.25
Machine Turnings	14.25
Short Shovel, Turnings	16.25
Mixed Borings, Turn.	14.25
Cast Iron Borings	13.25
Low Phos.	21.75

DETROIT:

(Dealers' buying prices)

Heavy Melting Steel	$17.32
No. 1 Busheling	17.32
Hydraulic Bundles	17.32
Flashings	17.32
Machine Turnings	9.50-10.00
Short Turnings	13.00-13.50
Cast Iron Borings	12.00-12.50
Low Phos Plate	19.82
No. 1 Cast	20.00
Heavy Breakable Cast	13.50-14.00

ST. LOUIS:

(Delivered consumer's plant)

Heavy Melting	$17.50
No. 1 Locomotive Tires	20.00
Misc. Rails	19.00
Railroad Springs	22.00
Bundled Sheets	15.00
Axle Turnings	14.00-14.50
Machine Turnings	9.50-10.00
Rerolling Rails	21.00
Steel Car Axles	21.00-21.50
Steel Rails, 3 ft.	21.50
Steel Angle Bars	20.00-20.50
Cast Iron Wheels	20.00
No. 1 Machinery Cast	20.00
Railroad Malleable	20.00-20.50
Breakable Cast	16.50
Stove Plate	18.00
Grate Bars	15.25
Brake Shoes	15.25

(Cast grades f.o.b. shipping point)

Stove Plate	18.00

CINCINNATI:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.50
No. 2 Heavy Melt. Steel	18.50
No. 1 Comp. Bundles	18.50
No. 2 Comp. Bundles	18.50
Machine Turnings	8.50- 9.00
Shoveling Turnings	10.50-11.00
Cast Iron Borings	10.50-11.00
Mixed Borings, Turnings	9.50-10.00
No. 1 Cupola Cast	20.00
Breakable Cast	16.50
Low Phosphorus	21.00-21.50
Scrap Rails	20.50-21.00
Stove Plate	16.00-16.50

LOS ANGELES:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$14.00
No. 2 Heavy Melt. Steel	13.00
No. 1, 2 Deal. Bundles	12.00
Machine Turnings	4.50
Mixed Borings, Turnings	4.00
No. 1 Cast	20.00

SAN FRANCISCO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$15.50
No. 2 Heavy Melt. Steel	14.50
No. 1 Busheling	15.50
No. 1, No. 2 Bundles	13.50
No. 3 Bundles	9.00
Machine Turnings	6.90
Billet, Forge Crops	15.50
Bar Crops, Plate	15.50
Cast Steel	15.50
Cut Structural, Plate, 1", under	18.00
Alloy-free Turnings	7.50
Tin Can Bundles	14.50
No. 2 Steel Wheels	16.00
Iron, Steel Axles	23.00
No. 2 Cast Steel	15.00
Uncut Frogs, Switches	16.00
Scrap Rails	16.00
Locomotive Tires	16.00

NONFERROUS METAL PRICES

Copper: Electrolytic or Lake from producers in carlots 12.00c, Del. Conn., less carlots 12.12½c, refinery; dealers may add ¾c for 5000 lbs. to carload; 1000-4999 lbs. 1c; 500-999 1½c; 0-499 2c. Casting, 11.75c, refinery for 20,000 lbs., or more, 12.00c less than 20,000 lbs.

Brass Ingot: Carlot prices, including 25 cents per hundred freight allowance; add ¼c for less than 20 tons; 85-5-5-5 (No. 115) 13.00c; 88-10-2 (No. 215) 16.50c; 80-10-10 (No. 305) 15.75c; Navy G (No. 225) 16.75c; Navy M (No. 245) 14.75c; No. 1 yellow (No. 405) 10.00c; manganese bronze (No. 420) 12.75c.

Zinc: Prime western 8.25c, select 8.35c, brass special 8.50c, intermediate 8.75c, E. St. Louis, for carlots. For 20,000 lbs. to carlots add 0.15c; 10,000-20,000 0.25c; 2000-10,000 0.40c; under 2000 0.50c.

Lead: Common 6.35c, chemical, 6.40c, corroding, 6.45c, E. St. Louis for carloads; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland-Akron-Detroit area, New Jersey, New York state, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston-Worcester-Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lbs. and over; add ½c 2000-9999 lbs.; 1c less than 2000 lbs.

Secondary Aluminum: All grades 12.50c per lb. except as follows: Low-grade piston alloy (No. 122 type) 10.50c; No. 12 foundry alloy (No. 2 grade) 10.50c; chemical warfare service ingot (92½% plus) 10.00c; steel deoxidizers in notch bars, granulated or shot, Grade 1 (95-97½%) 11.00c, Grade 2 (92-95%) 9.50c to 9.75c, Grade 3 (90-92%) 8.50c to 8.75c, Grade 4 (85-90%) 7.50c to 8.00c; any other ingot containing over 1% iron, except PM 754 and hardness, 12.00c. Above prices for 30,000 lb. or more; add ¼c 10,000-30,000 lb.; ½c 1000-10,000 lbs.; 1c less than 1000 lbs. Prices include freight at carload rate up to 75 cents per hundred.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lbs.), 20.50c lb., add 1c for special shapes and sizes. Alloy ingots, incendiary bomb alloy, 23.40c; 50-50 magnesium-aluminum, 23.75c; ASTM B93-41T, Nos. 2, 3, 4, 12, 13, 14, 17, 23.00c; Nos. 4X, 11, 13X, 17X, 25.00c; ASTM B107-41T, or B-90-41T, No. 8X, 23.00c; No. 18, 23.50c; No. 18X, 25.00c. Selected magnesium crystals, crowns, and muffs, including all packing screening, barrelling, handling, and other preparation charges, 23.50c. Prices for 100 lbs. or more; for 25-100 lbs., add 10c; for less than 25 lbs., 20c. Incendiary bomb alloy, f.o.b. plant, any quantity; carload freight allowed all other alloys for 500 lbs. or more.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lbs., 1½c 1000-2239. 2½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straits), 52.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05 per cent maximum arsenic, 51.87½c; Grade C, 99.65-99.79% incl. 51.62½c; Grade D, 99.50-99.64% incl., 51.50c; Grade E, 99-99.49% incl. 51.12½c; Grade F, below 99% (for tin content), 51.00c.

Antimony: American, bulk carlots f.o.b. Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 14.50c; 99.8% and over (arsenic, 0.05%, max. and other impurities, 0.1%, max.) 15.00c. On producers' sales add ¼c for less than carload to 10,000 lb.; ½c for 9999-224-lb.; and 2c for 223 lb. and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.5%, f.o.b. refinery 35.00c lb.; pig and shot produced from electrolytic cathodes 36.00c; "F" nickel shot or ingot for additions to cast iron, 34.00c; Monel shot 28.00c.

Mercury: OPA ceiling prices per 76-lb. flask f.o.b. point of shipment or entry. Domestic produced in Calif., Oreg., Wash., Idaho, Nev., Ariz., $191; produced in Texas, Ark. $193. Foreign, produced in Mexico, duty paid, $193. Open market, spot, New York, nominal for 50 to 100 flasks; $118 to $120 in smaller quantities.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be., $17 lb. contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks and all other "regular" straight or flat forms 90.00c lb., del.; anodes, balls, discs and all other special or patented shapes 95.00c lb. del.

Cobalt: 97-99%, $1.50 lb. for 550 lb. (bbl.); $1.52 lb. for 100 lb. (case); $1.57 lb. under 100 lb.

Indium: 99.9%, $7.50 per troy ounce.

Gold: U. S. Treasury, $35 per ounce.

Silver: Open market, N. Y. 44.75c per ounce.

Platinum: $35 per ounce.

Iridium: $165 per troy ounce.

Palladium: $24 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for copper. Freight prepaid on 100 lbs. or more.)

Sheet: Copper 20.87c; yellow brass 19.48c; commercial bronze, 90% 21.07c, 95% 21.28c; red brass, 80% 20.15c, 85% 20.36c; phosphor bronze, Grades A and B 5% 36.25c; Everdur, Herculoy, Duronze or equiv. 26.00c; naval brass 24.50c; manganese bronze 28.00c; Muntz metal 22.75c; nickel silver 5% 26.50c.

Rods: Copper, hot-rolled 17.37c, cold-rolled 18.37c; yellow brass 15.01c; commercial bronze 90% 21.32c, 95% 21.53c; red brass 80% 20.40c, 85% 20.61c; phosphor bronze Grade A, B 5% 36.50c; Everdur, Herculoy, Duronze or equiv. 25.50c; Naval brass 19.12c; manganese bronze 22.50c; Muntz metal 18.87c; nickel silver 5% 26.50c.

Seamless Tubing: Copper 21.37c; yellow brass 22.23c; commercial bronze 90% 23.47c; red brass 80% 22.80c, 85% 23.01c.

Extruded Shapes: Copper 20.87c; architectural bronze 19.12c; manganese bronze 24.00c, Muntz metal 20.12c; Naval brass 20.37c.

Angles and Channels: Yellow brass 27.98c; commercial bronze 90% 29.57c, 95% 29.78c; red brass 80% 28.65c, 85% 28.86c.

Copper Wire: Soft, f.o.b. Eastern mills, carlots 15.37½c, less-carlots 15.87½c; weatherproof, f.o.b. Eastern mills, carlots 17.00c, less-carlots 17.50c; magnet, delivered, carlots 17.50c, 15,000 lbs. or more 17.75c, less carlots 18.25c.

Aluminum Sheets and Circles: 2s and 3s, flat, mill finish, base 30,000 lbs. or more; del.; sheet widths as indicated; circle diameters 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers; full sheets 9.50c; cut sheets 9.75c; pipe 8.15c, New York; 8.25c, Philadelphia, Baltimore, Rochester and Buffalo; 8.75c, Chicago, Cleveland, Worcester, Boston.

Zinc Products: Sheet f.o.b. mill, 13.15c; 36,000 lbs. and over deduct 7%. Ribbon and strip 12.25c, 3000-lb. lots deduct 1%, 6000 lbs. 2% 9000 lbs. 3%, 18,000 lbs. 4%, carloads and over 7%. Boiler plate (not over 12") 3 tons and over 11.00c; 1-3 tons 12.00c; 500-2000 lbs. 12.50c; 100-500 lbs. 13.00c; under 100 lbs. 14.00c. Hull plate (over 12") add 1c to boiler plate prices.

Plating Materials

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lbs. to 1 ton 17.75c; under 400 lbs. 18.25c.

Copper Anodes: Base 2000-5000 lbs., del.; oval 17.62c; untrimmed 18.12c; electro-deposited 17.37c.

Copper Carbonate: 52-54% metallic cu, 250 lb. barrels 20.50c.

Copper Cyanide: 70-71% cu, 100-lb. kegs or bbls. 34.00c f.o.b. Niagara Falls.

Sodium Cyanide: 96%, 200-lb. drums 15.00c; 10,000-lb. lots 13.00c f.o.b. Niagara Falls.

Nickel Anodes: 500-2999 lb. lots; cast and rolled carbonized 47.00c; rolled, depolarized 48.00c.

Nickel Chloride: 100-lb. kegs or 275-lb. bbls. 18.00c lb., del.

Tin Anodes: 1000 lbs. and over 58.50c, del.; 500-999 59.00c; 200-499 59.50c; 100-199 61.00c.

Tin Crystals: 400 lb. bbls. 39.00c f.o.b. Grasselli, N. J.; 100-lb. kegs 39.50c.

Sodium Stannate: 100 or 300-lb. drums 36.50c, del.; ton lots 33.50c.

Zinc Cyanide: 100-lb. kegs or bbls. 33.00c, f.o.b. Niagara Falls.

Scrap Metals

Brass Mill Allowances: Prices for less than 15,000 lbs. f.o.b. shipping point. Add %c for 15,000-40,000 lbs.; 1c for 40,000 lbs. or more.

	Clean Heavy	Rod Ends	Clean Turnings
Copper	10.250	10.250	9.500
Tinned Copper	9.625	9.625	9.375
Yellow Brass	8.625	8.375	7.875
Commercial bronze 90%	9.375	9.125	8.625
95%	9.500	9.250	8.750
Red Brass, 85%	9.125	8.875	8.375
Red Brass, 80%	9.125	8.875	8.375
Muntz metal	8.000	7.750	7.250
Nickel Sil., 5%	9.250	9.000	4.625
Phos. br., A, B, 5%	11.000	10.750	9.750
Herculoy, Everdur or equivalent	10.250	10.000	9.250
Naval brass	8.250	8.000	7.500
Manganese bronze	8.250	3.000	7.500

Other than Brass Mill Scrap: Prices apply on material not meeting brass mill specifications and are f.o.b. shipping point; add ¾c for shipment of 60,000 lbs. of one group and ½c for 20,000 lbs. of second group shipped in same car. Typical prices follow:

(Group 1) No. 1 heavy copper and wire, No. 1 tinned copper, copper borings 9.75c; No. 2 copper wire and mixed heavy copper, copper tuyeres 8.75c.

(Group 2) soft red brass and borings, aluminum bronze 9.00c; copper-nickel and borings 9.25c; car boxes, cocks and faucets 7.75c; bell metal 15.50c; babbit-lined brass bushings 13.00c.

(Group 3) zincy bronze borings, Admiralty condenser tubes, brass pipe 7.50c; Muntz metal condenser tubes 7.00c; yellow brass 6.25c; manganese bronze (lead 0.00%-0.40%) 7.25c, (lead 0.41%-1.0%) 6.25c; manganese bronze borings (lead 0.00-0.40%) 6.50c, (lead 0.41-1.00%) 5.50c.

Aluminum Scrap: Prices f.o.b. point of shipment, respectively for lots of less than 1000 lbs.; 1000-20,000 lbs. and 20,000 lbs. or more, plant scrap only. Segregated solids: S-type alloys (2S, 3S, 17S, 18S, 24S, 32S, 52S) 9.00c, 10.00c, 10.50c; All other high grade alloys 8.50c, 9.50c, 10.00c; low grade alloys 8.00c, 9.00c, 9.50c. Segregated borings and turnings: Wrought alloys (17S, 18S, 32S, 52S) 7.50c, 8.50c, 9.00c; all other high grade alloys 7.00c, 8.00c, 8.50c; low grade alloys 6.50c, 7.50c, 8.00c. Mixed plant scrap, all solids, 7.50c, 8.50c, 9.00c; borings and turnings 5.50c, 6.50c, 7.00c.

Lead Scrap: Prices f.o.b. point of shipment. For soft and hard lead, including cable lead, deduct 0.55c from basing point prices for refined metal.

Zinc Scrap: New clippings, old zinc 7.25c f.o.b. point of shipment; add ½-cent for 10,000 lbs. or more; New die-cast scrap, radiator grilles 4.95c, add ½c 20,000 or more. Unsweated zinc dross, die cast slab 5.80c any quantity.

Nickel, Monel Scrap: Prices f.o.b. point of shipment; add ½c for 2000 lbs. or more of nickel or cupro-nickel shipped at one time and 20,000 lbs. or more of Monel. Converters (dealers) allowed 2c premium.

Nickel: 98% or more nickel and not over copper 26.00c; 90-98% nickel, 26.00c per lb. nickel contained.

Cupro-nickel: 90% or more combined nickel and copper 26.00c per lb. contained nickel, plus 8.00c per lb. contained copper; less than 90% combined nickel and copper 26.00c for contained nickel only.

Monel: No. 1 castings, turnings 15.00c; new clipping 20.00c; soldered sheet 18.00c.

Sheets, Strip . . .

Sheet & Strip Prices, Page 138

Practically the only change in the sheet situation is further extension in delivery dates as orders continue to pile up. In contrast to the recent tendency to limit inventories consumers now seek to increase stocks to meet contingencies of a longer war. In both hot and cold-rolled sheets some tonnage is available in June but most delivery promises fall in third quarter, with some producers offering no better than fourth quarter.

New York—Extended delivery schedules, combined with increasing munitions demands, have resulted in a sharp increase in sheet inquiry here. Car builders, warehouses and manufacturers of various bomb components and other items are shopping around extensively in an effort to get orders on mill books for shipment as early as possible.

From a general over-all tendency a short while ago to reduce inventories as much as possible within reasonable bounds of safety, there is now the disposition to build them up as much as Washington will permit, as a result of prospects of the war in Europe lasting longer than anticipated only a few weeks ago and of a number of existing contracts not only being extended but actually increased.

Some hot and cold-rolled tonnage is still available in June, but most delivery promises on these grades now fall in third quarter, with certain producers booked up solidly until September on cold-rolled and not far behind on hot-rolled. The situation in galvanized sheets is even more extended. At least one producer has a little tonnage available for June, but the great majority are booked well into third quarter and as has been the case for some time past, certain sellers have nothing available before fourth quarter.

Silicon sheets are being quoted for May shipment in some quarters and stainless steel promises run late March and April. Long ternes are available in April.

In all these grades some spot openings appear from time to time, but in the main are scattered.

Cincinnati — Pressure for delivery of sheets and continuing active demand indicates further tightening on all grades. Delivery promises now extend well into May. In fact, schedules are nearly filled for entire first half. The demand is broad, with possibility that restored old programs may bring an overload for the early part of the year. Shortage of fuel gas, blamed on low temperature, has curtailed some mill operations. The cold has also hampered transportation and sheet deliveries are lagging.

Boston—Sustained heavy replacement of narrow cold strip has filled second quarter schedules, which are subject to numerous revisions as to rolling and delivery. Increased tonnage for small arms includes nearly 1000 tons for rifle clips and spacers for the Springfield, Mass., armory, shipment to start in April. The spacer share of this inquiry is about 400 tons, of low-carbon strip. The increased landing mat program is developing stronger inquiry for spring steel clips. Broadening requirements for war steel also stimulate demand from bearing plants, notably 1010 and 1065 grades. Alloys, as with most carbon grades, are sold through June. Hot strip deliveries to cold mills approximate schedules, with some extensions, but to the general fabricating trade and jobbers some grades are in third quarter.

Cleveland—Sellers report no decrease in bookings. Order backlogs are growing, with hot-rolled sheets now extended from May into June and July. Cold-rolled items are promised for May delivery, while galvanized sheet schedules extend into August. Program revisions include a sharp upturn in steel requirements for landing mats and steel barrel and drum stock. Extensive increase in miscellaneous new orders the past 30 days, many of which carried top directives, has pushed back delivery schedules on regular CMP orders to the extent that the carryover tonnage by the end of this month is expected to be the largest since early last year.

Chicago — Hot-rolled sheets stand as the tightest of all steel products. This is due to the fact that because of Army and Navy demand for huts, barracks, drums, blitz cans, ammunition boxes, bomb parts and landing mat, directives are more numerous and are interfering with production schedules already set up. Some mills estimate that these directives are likely to cause three to four weeks delay in promised shipment of hot-rolled pickled, cold-rolled and galvanized sheets. It is understood that about a dozen out of 50 original manufacturers of landing mat are having contracts reinstated. In the case of one maker, operations will expand from one line one shift to two lines three shifts.

Philadelphia — While both hot and cold-rolled sheets can be had in second

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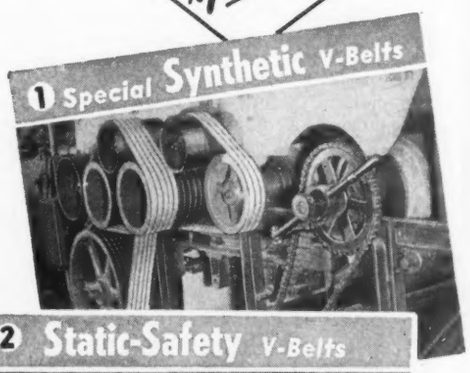

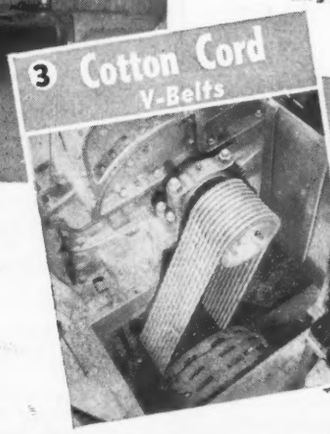

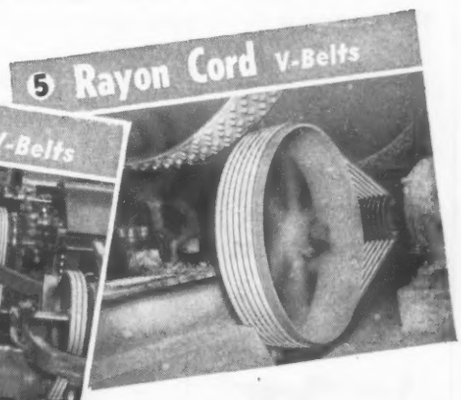

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quarter, promises generally fall late in that period and beyond. Some producers on one grade or another have little to offer before August or September. Cold-rolled schedules in the main have stiffened considerably since the beginning of the year. Galvanized sheet demand continues to expand despite use of painted and black sheets as substitutes. Some tonnage can be obtained for June but most promises are much beyond that. Silicon sheets fall in May in some cases and terne plate deliveries have expanded into April and May, with substantial orders placed recently for fuse containers.

Pittsburgh — Buying continues heavy with tonnages now being placed for revived landing mat and container programs. Sources here intimate that the 1945 program on 10 gage hot-rolled sheets will run about 40,000 tons per month for landing mats. There is more buying of galvanized sheet for storage depots and troop barracks, mostly to be erected outside the limits of continental United States. Last week's report that Carnegie-Illinois Steel Corp. would transfer men from other departments into its galvanizing operations at Vandergrift, Pa., works is regarded as a forerunner of similar action by other producers in order to meet the unprecedented demand for galvanized material during the next few months.

Steel Bars . . .

Bar Prices, Page 138

Increased demand for bars, both carbon and alloy, has carried deliveries into second quarter and on some descriptions near midyear is the rule. Some bars needed for munitions, asking January and February delivery, will require directives to meet needs. The lag in alloy bars, apparent for some time, has changed and shipment by most makers now is in March, attributed to heavier airplane production.

New York—While some smaller bar sizes can be picked up within eight to ten weeks, most carbon bar tonnage is not available before second quarter and on some larger sizes not before the end of that period. Cold-drawn carbon bars, running 1½ inch and over, fall in late May and June.

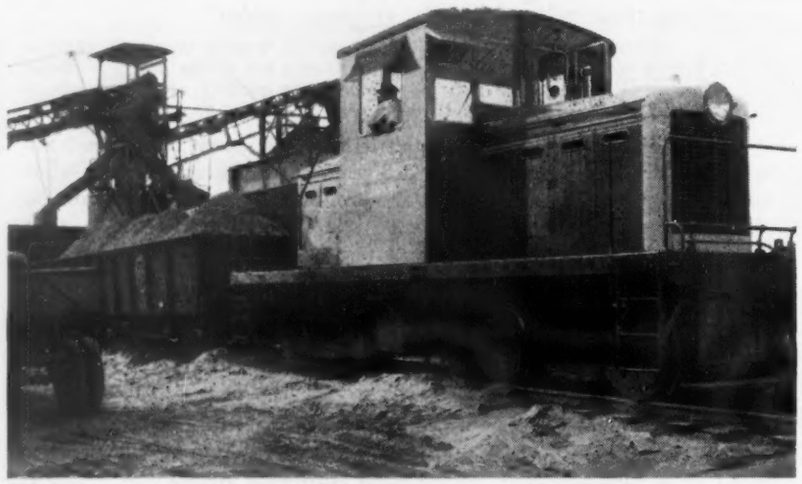
Demand for cold-drawn rocket steel is particularly pressing. Manufacturers of this type of ammunition have recently entered the market for deliveries in late January and February, which producers are quick to point out is simply out of the question unless directives can be obtained. Small sizes, for fuses and light ammunition, can be had in April.

Alloy steel bar shipments are extending more rapidly, after having lagged for many months. March now appears to be about the earliest that most producers have to offer. The spurt in alloy requirements is ascribed primarily to heavier demands from the aircraft industry.

Boston—Bar requirements are expanding in tempo with increased ordnance and equipment parts contracts; heavier consumption is also indicated by increased industrial scrap produced at fabricating plants. With a fourth production line for heavy artillery shells, 105 mm., at Lowell, Mass., being assembled, higher production goals are sought at other plants. With few exceptions, one being shipyards, plants fabricating bars are more active, including forgings, aircraft components, small arms and miscellaneous, notably the arsenals. Rocket program is also increasing demand for bars. Cold-drawn orders are mounting, also alloys. Deliveries and manpower, the former extending steadily, are major factors. A soft spot is in tool steel; surplus inventories are large in some instances and for the country as a whole such stocks are not moving briskly or at firm prices.

Cleveland—Shell steel requirements are expected to reach record levels toward the close of this quarter and through the remainder of the first half. Some mills interests are doubtful that output of large rounds can keep pace with the steadily rising capacity of shell fabricating facilities. There is a shortage of gun and shell steel, due primarily to growing shortage of manpower. Republic Steel Corp. recently increased the capacity of the 12-inch mill at the Corrigan McKinney plant by 10,000 tons to 30,000 tons monthly through installation of a new furnace. However, a walkout at this mill last week, because of the change in tonnage rate instituted when the new mill was expanded, resulted in a loss of considerable bar tonnage.

Philadelphia — Gun and shell requirements dominate bar demand, although specifications are coming out for a diversity of other needs as well. Truck manufacturers are ordering particularly heavily and railroad and equipment builders and shipyards are specifying freely. The spurt in alloy bars is reflected in demand from the aircraft industry. Producers of alloy bars are now



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5 tons of coal @ $4.50 per ton	$22.50	
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25 Gallons of Oil @ 8c a Gallon		2.00
Net Savings		$25.70

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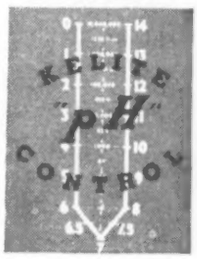

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scheduled 60 to 90 days ahead, compared with 30 and 45 days recently. In general, carbon bar shipments run from April into third quarter, depending on size and mill. Deliveries on larger sizes are most extended and in cold-drawn bars there is a special stringency in 4 and 5-inch rounds for the rocket program. Delivery promises on these sizes fall late in second quarter.

Chicago — Currently the bar situation is growing tighter, partly due to increases in war goods production, but more specially by crowding from the shell program. Deliveries on carbon bars are in June and July, and alloy in March, although the latter show signs of moving back in face of growing demand.

Pittsburgh — Already tight with heavy new demands, bar markets face additional difficulties due to fuel shortage, which has reduced steel production in the Pittsburgh district. Bar production, both here and in Youngstown, will be insufficient to meet scheduled deliveries in January, with the result that a substantial carryover will be forced on to February schedules. This will probably result in reduced shipments to some of the critical programs, although it is probable the heavy shell tonnages will be covered and that program will not suffer from the steel shortage. Total volume of the shortage, of course, depends on the weather, but at the moment approximately 20 open hearths are idle for lack of fuel in this area, which is a temporary condition.

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Steel Plates . . .

Plate Prices, Page 139

Distribution of steel plates for the Maritime Commission program has given platemakers heavier schedules and most sheared mills are booked through first quarter, with comfortable tonnages beyond that. Strip mills are seeking plate tonnage to aid them in holding employes of value. Some of these mills could not return to sheet and strip production because of insufficient labor to handle the more exacting work in those products. However, the general trend continues downward for the long view.

New York — While an effort is being made to place as much plate tonnage as possible for the new Maritime Commission program with sheared mills, strip mills are coming in for a portion, especially those in the position of not having enough manpower to expand their sheet rolling operations but who have more than enough to meet the substantially reduced plate rolling schedules which have prevailed of late.

In other words, in order to provide work for their present employes and who, in fact, would be the key men in any development of their sheet rolling organization later, certain strip mills are pressing for a share in the plate work now being distributed. One strip mill, for instance, which up until a week ago could offer plate deliveries in January has obtained sufficient new work from the Maritime Commission to step schedules up to March.

Meanwhile, most sheared mills are now booked up solidly for first quarter, as a result of participation in this program, and backlogs for beyond have been bolstered somewhat.

Warehouses are pressing harder for plates than at any time within the past several weeks, due not only to improvement in demand but to somewhat more extended mill schedules.

Boston — Plate buying continues slack; inventory adjustments and the fact most shipyards have orders in mills for first quarter requirements are primary reasons. Reversing the trends of a few weeks back, warehouses are not pressing for tonnage; inventories are balanced and in a few instances deliveries are deferred. New England Shipbuilding Corp., Portland, Me., has been offered contracts for 12 modified Liberty ships on a flat price basis. This yard is nearing completion of old contracts; whether the new work will be accepted depends on costs now being figured.

Building every type of combat ship, from destroyer escorts to largest aircraft carriers and battleships, performance of Bethlehem yards at Quincy and Hingham, Mass., is outstanding. They launched 25 more ships last year than 1943: Quincy (Fore river) launched 37 naval craft and delivered 38; Hingham launched 90 and delivered 91; East Boston (Bethlehem), repaired 1641 ships, completed 34 conversion jobs and made 112 major overhauls.

As the Portland maritime yard has been turning out nine ships a month with 13 ways and basins, offer of contracts for 13 modified Liberty ships in the supplemented program is not impressive as portending high operations through 1945. Bath Iron Works, as with other yards producing navy combat ships, seems assured capacity schedules through the year. Although employing nearly 10,000 less, Portland built more ships last

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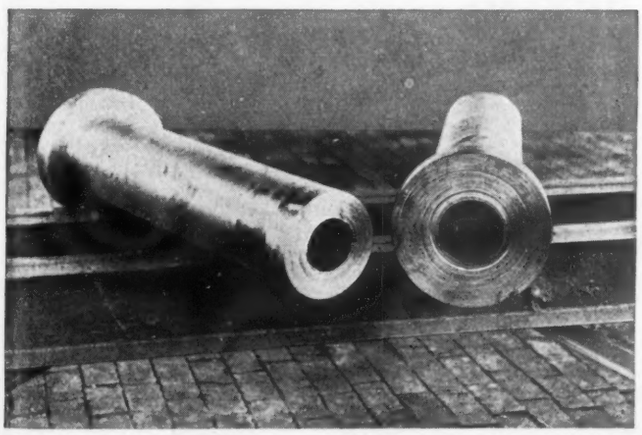

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year than in 1943 and since Pearl Harbor, when the yard was only partially completed, 236 ships have been launched up to Jan. 1.

Cleveland — Authorization of a large number of additional cargo vessels for the Maritime Commission is expected to be an important factor in sustaining overall plate requirements over coming months. Currently output remains in excess of incoming business but the spread is expected to be narrowed as the increased directive ship tonnage is placed. No action is yet reported in regard to possibility of granting railroad equipment builders special tonnage directives. Schedules on Republic Steel Corp.'s strip mill at Cleveland, formerly entirely on plate production, have been partially altered for rolling sheets.

Philadelphia — Bolstered by the new maritime program, plate schedules for the current quarter are well maintained. Some producers have nothing to offer before April. Most of the tonnage for this program is being scheduled for sheared mills, although some early requirements are slated for strip mills not yet shifted to sheet production. Requirements of the Sun Shipbuildinig & Dry Dock Co., Chester, Pa., for the 20 tankers it has been awarded involve 70,000 tons of plates and 20,000 tons of shapes and bars.

Chicago — From all appearances, local mills will not participate in any major way in the new program for the 226 new ships of the Maritime Commission. Most of this tonnage apparently will go to eastern mills in which area the ships are to be built. Nevertheless, plate mill schedules here are tighter through a heavy volume of miscellaneous orders, including some directives. Because of this, one steelmaker finds the increased business will preclude giving to sheet production the relief which had been planned.

Pittsburgh — Despite anticipated reduction in plate buying for first quarter of 1945, a substantial volume of plate business is now on books and fairly heavy orders are being received. While total new business does not begin to match the flow at this time a year ago, it is also true that the time available for plate production on the strip-sheet mills has also been reduced, with the net result that the schedule is not much easier now, regardless of lower volume. Most mills anticipate full schedules through first half, although there still remains a fair volume of available tonnage for March and later.

Wire . . .

Wire Prices, Page 139

Boston — Orders are reaching wire mills well in excess of shipments; directives are more frequent, displacing considerable volume from schedule. Rope and communications requirements cut deeply into supply of drawn wire available, heavily taxing galvanizing equipment. Continuing directives on both have been increased and demand for aircraft has stepped up sharply. Mills are booked well into second quarter on numerous products, including fine wire specialties with small capacity open for the current quarter. So heavily loaded are some departments that acceptance of additional tonnage for wanted delivery is hardly possible without directives. Ratio of high carbon in new volume is relatively high. Little wire is available for civilian use and few Z-1 allotments are filled. Displaced scheduled volume will also add to carry-overs this month.

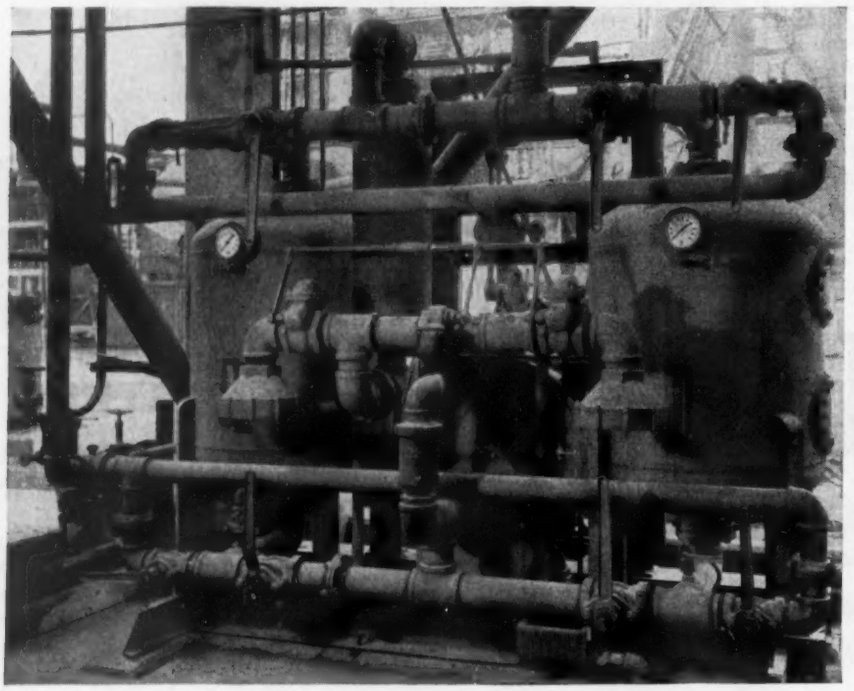
Chicago — Demand for merchant wire products is not quite so strong as in last part of 1944. Pressure for nails is still as insistent, with needs exceeding supply. Cold weather apparently has eased the call for fencing, but has little affected posts. Likewise, demand for electrical wire and cable is not as great as in the early part of last year, nevertheless, production capacity of mills is taxed.

New York — Additional capacity for tire bead wire has been assigned, further limiting drawing capacity for more sizes, which for high-carbon is notably tight. Deliveries on most products have extended sharply. Many products required for war programs are sold through second and well into third quarter. Small spring material demand is up substantially. Production schedules are revised frequently to make way for directives, crowding out other important volume, including some industrial brush wire.

Tin Plate . . .

Tin Plate Prices, Page 139

Boston—Packing quotas for clams and herring-sardines are unlimited under the M-81 order as amended; record sardine pack by Maine last year approached 3.5



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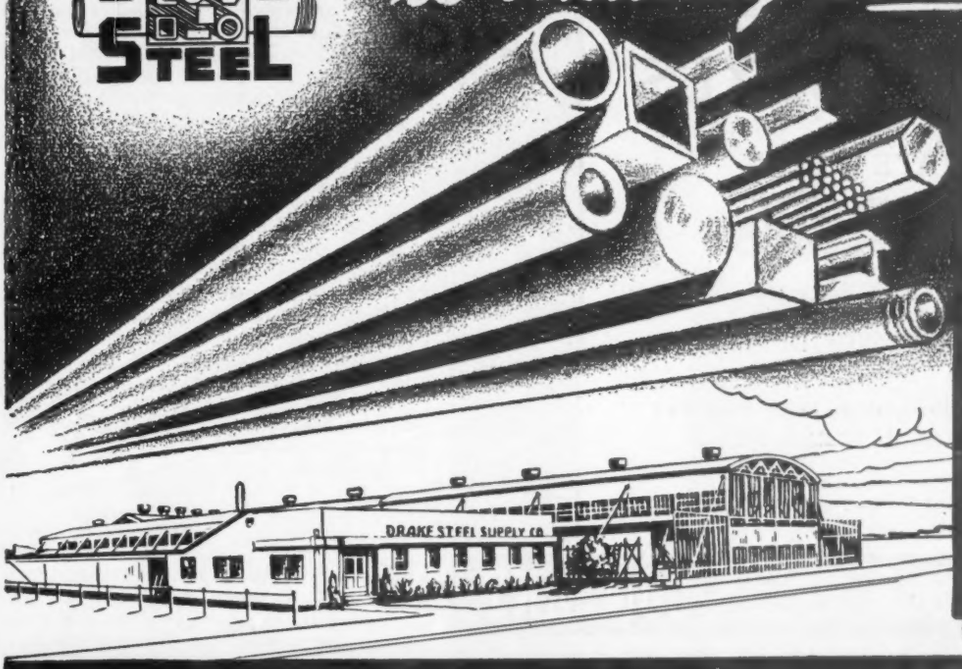

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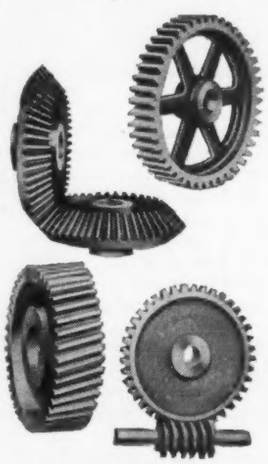

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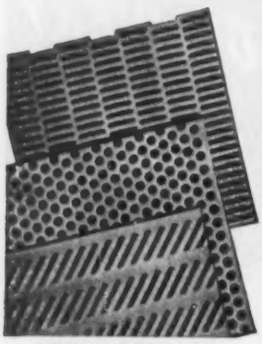
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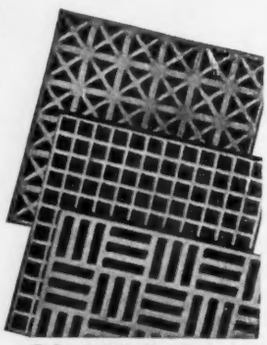
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Pittsburgh—Revision of M-81 to permit use of black plate and 0.25-pound electrolytic tin plate for an almost unlimited array of general line cans came as a surprise to some quarters of the industry. There had been considerable discussion as to the appropriateness of releasing tin mill products for this purpose, especially in view of the increasingly tight situation in flat-rolled steel. The March tin plate quota, previously set at 300,000 tons, has been reduced to 275,000 tons, but the January and February totals remain unchanged at 300,000 tons, with orders reportedly already received to support operations at that level. There have been scattered reports that March tonnage would be cut down so that total first-quarter production would be equal to fourth-quarter output. This would mean a further cut of 100,000 tons in March and it does not now seem probable that such a drastic reduction will be made. Prospects are still good that total output for 1945 will run approximately 3,400,000 tons, or about 300,000 tons above last year.

Structural Shapes . . .

Structural Shape Prices, Page 139

Pittsburgh — Probably the heaviest volume of new structural business arises from the Army program to build large numbers of troop barracks and supply depots of a combination of light structurals and galvanized corrugated sheets. There have been no definite figures as to the total of this program, but it is known that 25,000 building units have been placed by the Columbus Quartermaster Depot and the structural tonnage in each unit is relatively heavy for this type of building.

Chicago—Larger fabricators are well occupied with work which originates from various sources, while smaller shops have a fair volume of essential building projects. To obtain early delivery on plain shapes from mills, directives are required. Federal Economic Administration is reported inquiring for 15,000 tons of sheet piling for ultimate delivery to France. Other inquiries for sheet piling include 7700 tons for the Navy and 6000 tons for the Army.

Philadelphia — Shapes are obtainable in April, although one large producer is sold out until May on both standard and wide-flanged sections. Ship requirements and the shell program are mainly responsible for the extended

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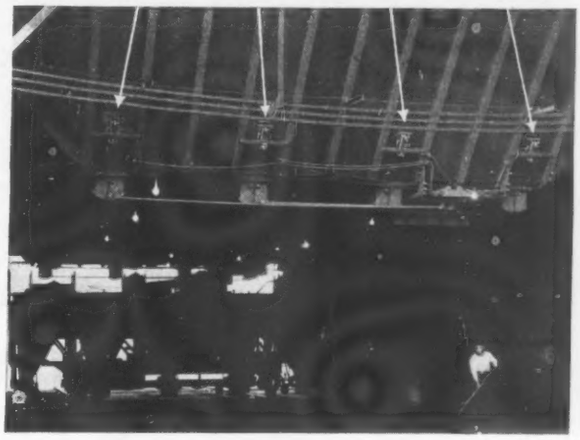

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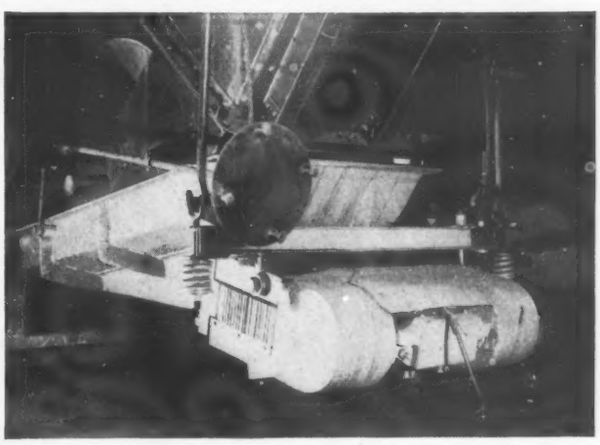

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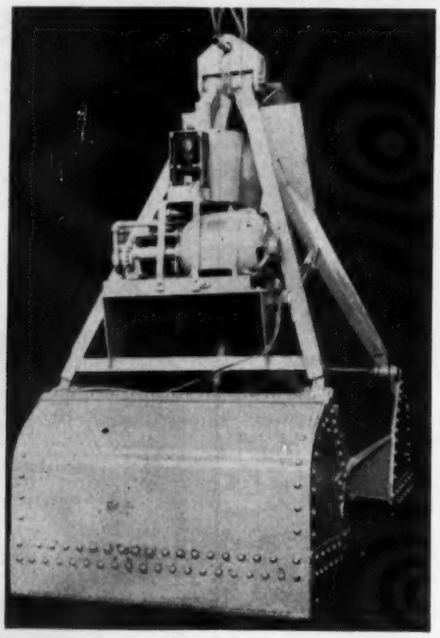

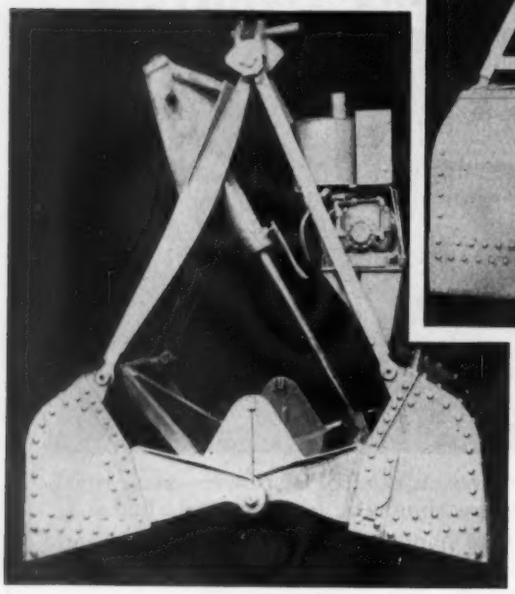

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Reinforcing Bars . . .

Reinforcing Bar Prices, Page 139

Pittsburgh — Total tonnage booked in December by producers east of the Rocky Mountains amounted to 41,000 net tons. On the surface this apparently is a substantial gain over the 26,500 tons scheduled in December, 1943, and high above the 1942 level of 18,100 tons. However, normal domestic consumption before the war was about 50,000 tons per month. The difficulty with the present tonnage is that considerably more than 50 per cent of the December total was for export. Actual new buying of concrete bars in the domestic market totaled only about 13,000 net tons. In addition, it now seems probable that the total production directive for January will not be reached. Fuel supply in midwestern areas has been so low that steel production will drop in January substantially below expected levels. Since a large proportion of new billet steel for reinforcing bars arises from excess steel production, it will not be possible for bar mills in many of the plants to obtain the steel permitted them under current directives. Meanwhile, new export business is developing at a rapid rate, and, together with a relatively small volume of business on the domestic front, will provide new business for the balance of first quarter at about the same level as December.

Rails, Cars . . .

Track Material Prices, Page 139

New York—Domestic freight car buying has dropped sharply, following placing of more than 15,500 freight cars in December, the largest monthly total of 1944. The recently noted award of 500 cars for the Baltimore & Ohio this month about winds up domestic lists of importance.

At present car builders are primarily concerned in obtaining steel for equipment already on their books and are having difficulty in many cases obtaining the schedules they desire. So heavy is the pressure for steel for various munitions programs, in fact, that it would not prove surprising if schedules on some of the car equipment on order will be set back substantially.

Recently there have been substantial cutbacks in rail and track accessory schedules for the current quarter, due primarily, it is believed, to pressure for shell steel and facilities on which such steel can be rolled.

Pig Iron . . .

Pig Iron Prices, Page 141

Conditions are tightening in pig iron supply as steelmakers require full supply for their operations and foundries have increased needs. Manpower shortage prevents relighting of idle furnaces whose output is needed. Shortage of foundry scrap grades has a tendency to increase demand for foundry pig iron. One stack has been relighted in the Pittsburgh district after being out since early December.

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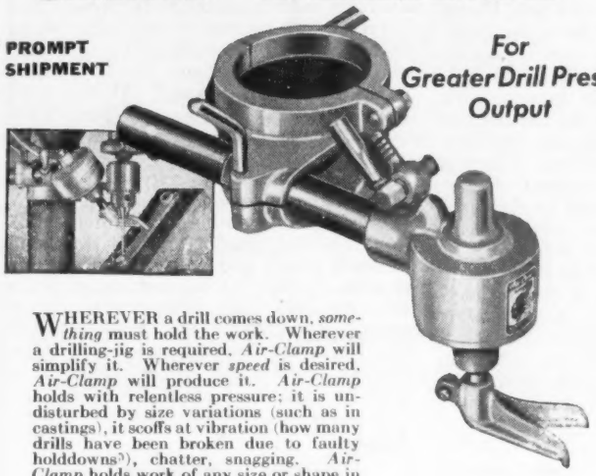

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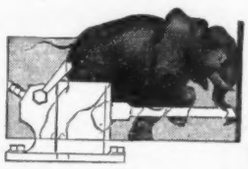

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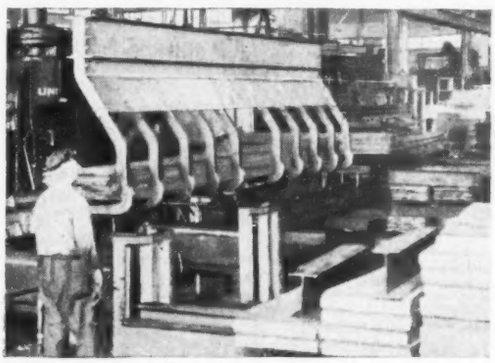

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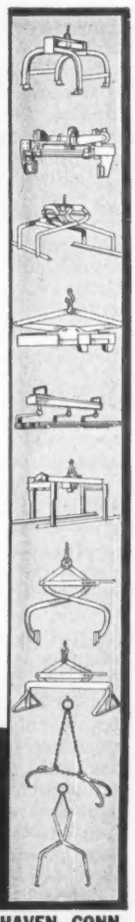

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Pittsburgh—There is still heavy demand for basic iron and blast furnace operators are hampered by insufficient manpower, which prevents lighting of stacks now idle. Jones & Laughlin Steel Corp. has blown in No. 1 stack at its Aliquippa, Pa., works, which was blown out Dec. 4. Because of the scrap shortage, merchant iron sellers here expect an increasing volume of demand from foundries, particularly since the Army is now making a survey to determine locations of foundries which might take on additional volume of castings production. There is no indication as to the volume of new work which may be placed in this area but little pig iron is now available for foundry use at minimum prices. It is still possible for foundries in this area to obtain necessary supplies of iron by paying freight rates from more remote points and some quarters believe there will develop enough demand for premium priced iron to require blowing in of high-cost merchant stacks in this district which are now idle.

Boston—Pressure for prompt spot delivery of pig iron is slightly heavier among some consumers apparently operating close on inventory. Shipping releases against full quarter commitments are more general; demand and requirements are unchanged, but more consumers are concerned as to tonnage due them through this quarter. There is some tightening, but supply is in balance on most grades, although stocks at merchant furnaces are limited. There are scattered adjustments of foundry schedules moving more urgent war requirements forward, but with the exception of some shops subcontracting on mill equipment, revisions are minor. Shops supplying the machine tool industry are maintaining schedules in most instances. Machine tool demand has not declined as much as indicated early last year. Valve producers still have substantial backlogs and Chapman Valve Co., Indian Orchard, Mass., with a tire plant, has No. 1 priority on manpower in the Springfield district.

Buffalo—Many large foundries in this area and New England face sharply curtailed operations because of lack of pig iron supply held up by snow. With increased orders for tank and truck castings absorbing light iron supplies on hand the situation is acute. Sellers report bookings for first quarter are expanding.

Producers report necessity for piling iron, even with operations at about 70 per cent of capacity, as railroads are unable to move cars. One producer requiring more than 30 cars per day reports some days bring no cars, adding to costs in additional handling of iron.

Cincinnati — Deliveries of northern foundry iron to this district are less prompt than normally, and the current explanation is that frigid weather has hampered transportation and handling. So far, it is said, the situation is not a reflection of tighter supplies. Deliveries of southern iron hold close to schedules. Foundries are trying to take in more iron, to bolster inventory, although attempts at expansion of the melt have not been successful.

Cleveland — Pig iron output in this district is now back to normal with all five furnaces at Republic Steel Corp.'s Corrigan McKinney plant pouring iron after being banked for a brief period 10 days ago. There are now 13 out of 14 furnaces active in the Cleveland-Lorain area. Blast furnace interests are concerned over the adequacy of coking coal supply over the winter months with severe winter weather adversely affecting mining operations, transportation and unloading of coal. Manpower shortage is also a factor in limiting pig iron production, and according to some steel interests will become increasingly worse should a number of blast furnaces now idle be forced back into service because of the increasing demand. Melters have around 20 days supply of iron, while estimated consumers' inventories average about 45 days.

Philadelphia — Scarcity of pig iron, particularly basic, is becoming more pronounced, due to adverse weather conditions affecting production and shipments at some points and to lighter operations at some furnaces in need of repair. Scrap shortage also causes larger use of pig iron in foundries. Pig iron producers are forced to turn down many orders and in some cases defer delivery on tonnage already booked.

Scrap . . .

Scrap Prices, Page 142

Scrap supply is impeded by heavy snow and cold in the industrial section of the country and offerings are light. Consumers of steelmaking grades are taking all material available and have not yet suffered from shortage. Prices on practically all grades are back at ceilings in nearly all districts. Allocations are being used again in some areas, railroads and large industrial consumers being affected.

Pittsburgh — All grades are at ceiling levels and demand is heavy. Some sources here expect the market to become increasingly tight through the remainder of the winter, although this opinion comes primarily from scrap sellers, including yard operators and brokers, and not so much from consuming plants. The situation in cast scrap becomes progressively worse as volume of foundry business increases. Government pressure for additional castings production has resulted in letters asking for assistance to large foundries in all parts of the country by the scrap trade. Local activity continues to be hampered by heavy snow and freezing weather of the worst winter in many years.

Cleveland—Divergent opinions as to the seriousness of the current tight situation in iron and steel scrap are expressed by consumers and brokers. A number of buyers and sellers are emphatic in the belief that the steel industry faces the most critical period of the war in meeting sharply expanded war production schedules with stocks at the lowest level since the summer of 1942, and steadily declining. They point out that this situation, combined with the sharp reduction in number of collectors and adverse winter weather, makes it practically impossible to reverse this downward trend. The other view is that many carloads of scrap are not being moved, with the railroads having all they can do to move perishable goods under the current severe weather conditions, production scrap is holding up well, although it consists mostly of turnings, and when the weather breaks dealers once more will be in a position to move scrap through their yards.

A substantial increase in the use of turnings in open-hearth operations is a likely development, with the present dearth of good open-hearth scrap grades

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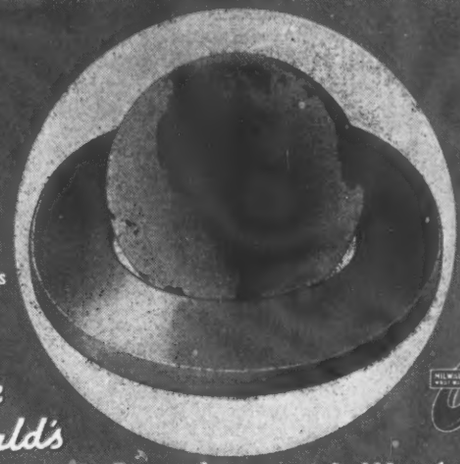

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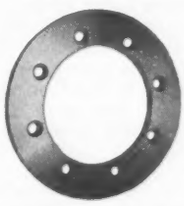

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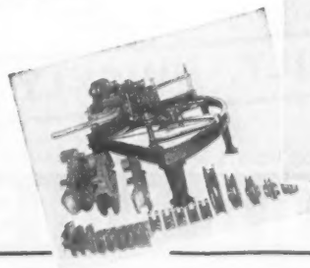

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expected by many scrap interests to continue over the remainder of the winter.

With steel mill interests paying a springboard of $1.50 a ton or more in a few instances, considerable more cross hauling of scrap is expected to develop over the coming months. If the current shortage continues the volume of material moving under allocation may reach that of the summer of 1942 when some open hearths were forced down because of lack of scrap.

Buffalo — With snow delaying rail shipments and reducing operations to a minimum in scrap yards a stronger tone has developed. Ceiling prices plus brokerage fees again are the rule on all items. Dealers report substantial orders on books with shipments far below normal. A leading mill consumer has placed an order for approximately 10,000 tons of turnings at ceiling prices. Mills have been forced to make considerable inroads on reserves. A dealer whose baling plant has been shut down for five weeks following a fire is expected to resume compressing at once.

Boston—With alloy scrap displaying more strength, including an allocation of segregated turnings presumably at ceiling, carbon steel firmness is further reflected by payment of port differentials on lighter grades of steelmaking scrap, including machine shop and short shoveling turnings. In the case of Boston this is 99 cents above the inland price. Alloys, first to break, show more firmness than in months. Demand for foundry scrap is brisk, with some consumer inventories low, resulting in frequent small lot buying for pickup delivery. Prices are at ceilings, as are electric furnace and low phos grades. Weather hampers yard operations.

St. Louis — More scrap grades have risen to ceiling in the past week, with few being quoted below that level. Allocations again are being placed on railroad scrap and large industrial producers and are expected to continue. Offerings are light, bad weather hampering collection and preparation, with transportation also difficult.

Cincinnati — The iron and steel scrap market is unchanged. Tonnage buying by mills has not appeared in the last few weeks, although some increase in buying is anticipated, probably this month. Weather conditions hampered collections and yard operations recently but melters' stocks have been adequate to avoid serious shortages.

Los Angeles—Several thousand tons of shipyard scrap have been allocated from the Los Angeles area to midwestern mills by the War Production Board. The quantity shipped is not disclosed, although it is enough to impart a firming quality to the scrap market, according to representative dealers.

Warehouse . . .

Warehouse Prices, Page 140

Cleveland—Distributors note a moderate increase in the size of individual orders as well as number, reflecting the enlarged munitions programs. Mill deliveries to warehouses have kept distributors' inventories in good balance with the exception of standard structural shapes and specialized sheet items. However, with lengthening mill deliveries on bars and sheets, flow of steel to warehouses in the immediate future may not be as steady as in recent weeks. Overall stocks are slightly heavier than a year ago. Manpower shortage continues to delay cutting and shearing operations.

New York — Steel orders from warehouse are heavier, including demand for alloys. More extended mill deliveries on most products channel additional tonnage to distributors; inquiry is in excess of supply for some products, including galvanized sheets, light gages of flat-rolled and wire, including nails. Shape demand is also sustained and bars are tighter. While plate buying is off from peak, demand is still substantial. Plates are nevertheless less active than most hot-rolled products. Cold-drawn seamless tubing stocks are limited after direct aircraft requirements are met.

Cincinnati — Warehouse demand has fully recoverd from slight dips during the holidays and January volume will attain the high marks of last October and November. Sales reflect some improvement in the machine tool industry. A pinch in supply concerns particularly sheets, structurals and some cold-rolled bars. Most jobbers called 1944 trade the largest since 1941.

Metallurgical Coke . . .

Coke Prices, Page 139

Pittsburgh — Cold weather over most of the country during December and thus far in January has resulted in a substantial decline in production and stocks of both coal and coke held by industrial concerns. According to the most recent figures released by Bureau of Mines, on Dec. 1 total industrial stocks amounted to some 43 days' supply, which was a net decline of 8.5 per cent from stocks held Nov. 1. It is anticipated that the supply during December will decline 10 to 15 per cent below that level. Stocks held by steelworks and by-product coke ovens were reported as of Dec. 1 as 26 days. While there are no available figures for Jan. 1, it seems probable that stocks as of that date will be about 22 to 23 days.

In addition, excessive snow and difficult weather conditions at the mines, as well as on the roads, have cut into coal production and have acted as a serious deterrent to production of beehive coke. For the final week of December, beehive coke production as reported by the Bureau of Mines totaled 94,700 net tons. It is estimated that operations in the Connellsville field for the past three weeks have been at 50 per cent of capacity, or slightly less. Bituminous coal production during the final week of the year was affected by holiday schedules as no coal was produced on Christmas Day and only a small tonnage on New Year's Day. The final week of 1944 was the lowest production of the year at 8,310,000 net tons. Total increase for the year was almost 30,000,000 tons over 1943, about 5 per cent.

Nonferrous Metals . . .

Nonferrous Prices, Page 143

New York — First quarter consumer requirements of refined copper are estimated at 457,000 tons. Shipments of new metal this month may approach 160,000 tons with war demand approaching another peak. Much depends on supply of manpower and in the Connecti-

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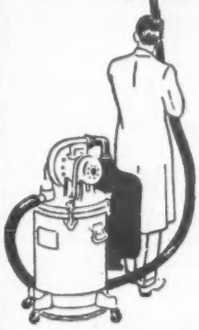

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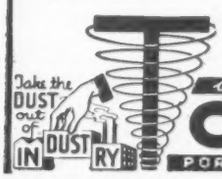

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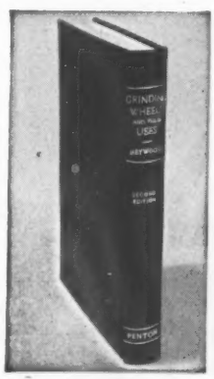

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cut Valley some vital brass plant production will be spread to other plant divisions. Brass strip is the most critical material.

Zinc is also reflecting war demand. Although some tonnage was probably against January requirements, shipments last month were at an all-time high, 84,074 tons. Stockpile for all slab zinc grades beginning the year was 232,-105 tons. Production last year totaled 901,330 tons, a monthly average of 75,-111 tons; shipments 842,735 tons, monthly average 70,228 tons. Daily average production was 2462 tons.

Canada . . .

Toronto, Ont. — Following the year-end lull in buying, fresh action has developed in Canadian iron and steel market and a heavy outpouring of orders was reported for the past week. Most new buying, however, is said to be associated with war work, especially in connection with recently placed United States orders with Canadian firms. Steel deliveries to the civilian trade is tightening and it now appears that further delay will be necessary in swinging into wide-scale production of consumer goods. Most steel producers in Ontario now are almost solidly booked through the first six months of the year, with approximately 50 per cent of orders from civilian consumers for delivery on an if and when basis. It is stated, however, that shipments against this type of business are uncertain and that war demand will continue to absorb most production of steel for the next three months, at least. Shells and ammunition are to be featured in future production, although manufacture of war vehicles also will be continued. Cancellation of British contracts with Canadian plants are said to be in prospect on a fairly large scale and action of this nature may tend to throw additional steel tonnages into civilian channels.

In production of railroad rolling stock and locomotives, Canadian plants are operating to the limit of their labor supply and officials of the various companies concerned announce that orders on hand from Canada, Russia and India are sufficient to keep plants operating at capacity through this year. These companies have placed large steel orders and have been prominent in the market lately for additional tonnages. Agricultural implement industry also has been a heavy buyer of steel and are operating close to capacity with large unfilled orders from domestic sources and for export.

Little change is reported in plate and delivery is said to be available within about two months. Slowing down in ship construction has made larger tonnages of plate available for other use, but much of this slack is being absorbed by increased buying by rolling stock builders and implement makers.

The movement of scrap iron and steel into and out of dealers' yards has been negligible for the past week or ten days, and comparatively little action in this respect has been reported for the past month. The general slowdown is almost entirely due to shutting off of supply through the adverse snow conditions.

Canadian iron and steel production for November showed a decline from October, while the total for the first 11 months was slightly above that for the corresponding period of 1943. During November eight of the 14 blast furnaces in Canada were blowing to produce 146,972 net tons of pig iron, which is at a rate of 63.6 per cent of total capacity.

Production of steel ingots and castings at 268,923 net tons was 89.8 per cent of rated capacity and included 256,504 tons of steel ingots and 12,419 tons of castings. For the 11 months ending with November output of steel ingots and castings totaled 2,780,928 net tons, while steel furnace charges included 1,389,732 tons of pig iron; 928,903 tons of scrap of consumers' own make and 775,366 tons of purchased scrap.

Following are comparative figures on production in net tons:

	Steel Ingots castings	Pig iron	Ferro-alloys
Nov. 1944 . .	268,923	146,972	15,280
Oct. 1944 . .	275,524	154,119	15,631
Nov. 1943 . .	259,444	142,249	16,169
11 Mos. 1944	2,780,928	1,713,476	170,037
11 Mos. 1943	2,769,156	1,621,009	201,649
11 Mos. 1942	2,851,527	1,810,633	194,069

Steel in Europe . . .

London—(*By Radio*)—Improved demand is met in Great Britain for shell steel. Locomotive and railroad car builders are active and requiring much steel. Light sheets are in demand for military purposes of many kinds. The metallurgical coke situation is somewhat difficult and supply is tight. Some improvement is noted in production of light castings.

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4600 tons, 20 hangers for U. S. Engineers, Columbus, O., 2300 tons divided between Robberson Steel Co., Oklahoma City, Okla., and Capitol Steel & Iron Co., Oklahoma City, Okla.; and other 2300 tons to Stupp Bros. Bridge & Iron Co., St. Louis; bids Dec. 27.

1795 tons, beam bridge over Arkansas river, Muskogee, Okla., for state highway department, to Robberson Steel Co., Oklahoma City, Okla.; J. A. Raines, Muskogee, Okla., contractor; bids Dec. 12.

850 tons, three transit sheds and two heavy material buildings, Stockton, Calif., for U. S. Navy, to Bethlehem Steel Co., Bethlehem, Pa.

407 tons, girder spans, Ashtabula, O., for Nickel Plate railroad, to Joseph T. Ryerson & Son Inc., Chicago; bids Dec. 9.

400 tons, Z and sheet piling, Jackson Park sea wall, for Chicago Park District, to Carnegie-Illinois Steel Corp., Chicago; Harry A. Thompson, Chicago, contractor; bids Dec. 5.

376 tons, highway bridge over Verdigris river, Muskogee, Okla., for state highway department, to Robberson Steel Co., Oklahoma City, Okla.

290 tons, including 240 tons sheet piling and 50 tons beams for batter piling, dock, Chicago, for Chicago, Rock Island & Pacific railroad, to Inland Steel Co., Chicago; Great Lakes Dredge & Dock Co., Chicago, contractor.

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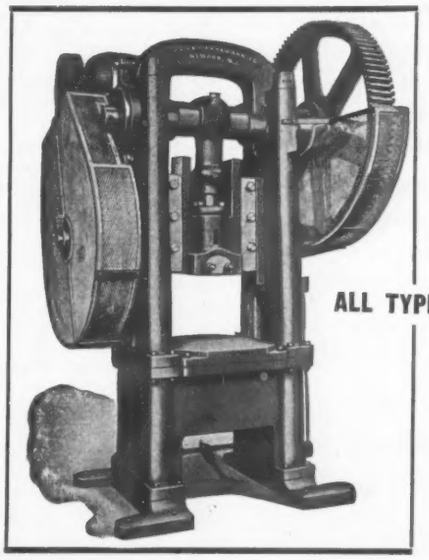

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REINFORCING BARS PLACED

840 tons, Veterans' Hospital addition, Lebanon, Pa., to Bethlehem Steel Co., Bethlehem, Pa.; originally placed with New York supplier.

430 tons, Veterans' Hospital addition, Dearborn, Mich., general contract to F. H. McGraw Co., New York and Hartford, Conn.

350 tons, Wagner Electric Corp., Wellston, Mo., to Missouri Rolling Mill Corp., St. Louis.

300 tons, National Carbon Co., St. Louis, to Laclede Steel Co., St. Louis.

135 tons, superstructure of filter and administration buildings, South District Filtration plant, Chicago, to Bethlehem Steel Co., Bethlehem, Pa.; S. N. Nielsen Co., contractor; original bid July 10, rebid Sept. 13.

110 tons, new car shops, Brainerd, Minn., for Northern Pacific railroad, to Truscon Steel Co., Youngstown, O.

REINFORCING BARS PENDING

550 tons, U. S. Veterans Administration hospital, Dearborn, Mich.; bids Jan. 9.

300 tons, U. S. Rubber Co., Detroit; bids Jan. 10.

300 tons, Lincoln Heights dwellings, Washington, D. C.

225 tons, Monsanto Chemical Co., Monsanto, Ill.

200 tons, Western Rubber Co., Goshen, Ind.

RAILS, CARS . . .

LOCOMOTIVES PENDING

Chicago & North Western, 28 diesel-electric locomotives; request made of Interstate Commerce Commission to permit financing of the building of the equipment by American Locomotive Co., New York, Whitcomb Locomotive Co., Rochelle, Ill., Baldwin Locomotive Works, Eddystone, Pa., and Electro Motive Division of General Motors Corp., La Grange, Ill.

CONSTRUCTION AND ENTERPRISE

OHIO

AKRON, O.—Firestone Tire & Rubber Co. has received WPB authorization for installation of equipment including rubber cutters, conveyors and plasticators, mills with drives, mixers, tread skids, etc., at Pottstown, Pa., to cost $16,963,000, expiring July 31, 1945; also for Defense Plant Corp., at Akron, installation of machinery and equipment costing $1,600,700, expiring at same date.

AKRON, O.—North East Ohio Area Inc. has been incorporated with $500 capital and 250 shares no par value to deal in machinery, dies, tools, patterns, fixtures and molds by M. E. Cook, Frank E. Whittemore and W. Lee Cotter, 70 Cherry street, Akron.

AKRON, O.—Bridgewater Mfg. Co., 219 East Miller street, will erect an addition to manufacture hydraulic cylinders and airplane parts, to cost about $40,000.

AKRON, O.—Burt Mfg. Co., 44 East South street, will alter its present plant for production of sheet metal roof ventilators, at cost of about $22,000.

CANTON, O.—Canton Drop Forge & Mfg. Co., 207 Twelfth street, will install boiler and operating equipment costing about $50,000.

CLEVELAND—Tomlin Corp. has been incorporated by Thomas B. Nisbet, owner of Petroleum Equipment Co., 3776 West 152nd street, to expand the latter company. Capital is $25,000. Will manufacture equipment and supplies for storage and transfer of liquids, pneumatic and hydraulic equipment and supplies.

CLEVELAND—Rockport Pattern Co., care Hines Mfg. Co., 1324 Hird avenue, J. F. Hines, president, has let contract to Esch Construction Co., Caxton building, for a one-story 60 x 240-foot pattern shop, estimated to cost about $75,000.

CLEVELAND—Bragg Bronze & Aluminum Co., 5408 Bragg avenue, F. J. Porter, president, recently reincorporated, plans postwar construction of a one-story 35 x 120-foot addition, costing about $25,000. (Noted Jan. 8.)

CLEVELAND—O'Neal Paint Products Inc., 13228 Madison avenue, Lakewood, plans erection of a 40 x 125-foot plant and 40 x 75-foot storage building, to cost about $50,000.

CLEVELAND—Perfection Spring Co. has been incorporated with 300 shares of $100 par value and 300 shares of $20 par value to manufacture parts for automotive vehicles by Frank J. Hessler of Deco Products Co., 1480 Lakeside avenue, and associates.

CLEVELAND—Phoenix Ice Machine Co., Harry E. Bollinger, president, 2711 Church avenue, will build a one-story assembly and storage building, 96 x 134 feet and 28 feet high, equipped with three 10-ton craneways.

MAINE

AUBURN, ME.—F. W. Winter, 29 Second avenue, will remodel a four-story 50 x 300-foot building for a refrigeration plant, on Railroad street, at estimated cost of $110,000.

MASSACHUSETTS

WORCESTER, MASS.—Pullman-Standard Car Mfg. Co., 27 West Mountain street, has let contract to Sumner S. Sollitt Co., 307 Michigan avenue, Chicago, at $168,500, for plant additions and alterations; one-story 50 x 280-feet, building 11; one story 60 x 60 feet, building 13; one story 30 x 40 feet, building 3; altering 90 x 400-foot building 3 and 13 x 30-foot office building. F. Stanton is architect and J. R. Boeringer is engineer, both of 307 Michigan avenue, Chicago.

CONNECTICUT

NORWALK, CONN.—Norwalk Tire & Rubber Co. will ask bids soon for an 80 x 100-foot plant costing about $60,000. Fletcher Thompson, Inc., 211 State street, Bridgeport, Conn., is engineer.

RHODE ISLAND

BRISTOL, R. I.—Bristol Mfg. Corp., Buttonwood avenue, has let contract to J. P. Flynn, 112 Lenox avenue, Providence, R. I., for a one-story 86 x 97-foot plant addition to cost about $40,000. L. A. Gardiner, 49 Hanover street, Providence, is engineer.

ILLINOIS

ROCKFORD, ILL.—Rupp Pattern Co. has let contract to Linden & Sons Inc. for a one-story plant addition.

ROCKFORD, ILL.—Rockford Bolt & Steel Co., manufacturer of bolts, nuts, screws, washers, etc., has let contract to Linden & Sons Inc. for a one-story plant addition.

MISSISSIPPI

OXFORD, MISS.—City has plans under way by W. E. Johnson Engineering Co. for a sewage disposal plant at Oxford, to cost about $50,000.

NORTH CAROLINA

CHARLOTTE, N. C.—King Chemical Co. has been incorporated by E. J. King, Atlanta, Ga., with $100,000 capital, to manufacture soaps and other chemical products.

GREENSBORO, N. C.—Guilford Foundry Co. has been incorporated by H. D. Wilson, 132 Northbridge street.

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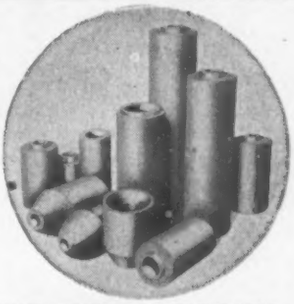

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LOUISIANA

LAFAYETTE, LA.—City board of trustees, C. C. Colomb, mayor, has let contract to J. B. McCrary Co., consulting engineer, Atlanta, Ga., for a proposed sewage disposal plant, incinerator and underpass.

NEW ORLEANS—Delta Shipbuilding Co., O. O. Carpenter, plant facilities engineer, has let contract to Chris Larsen Co., Maritime building, for a 30 x 100-foot addition to sheet metal shop at Industrial Canal and Florida avenue.

MISSOURI

KANSAS CITY, MO.—Southwestern Bell Telephone Co., Kansas City, M. J. Stooker, general manager, plans $140 million postwar construction program, in addition to normal growth expenditures of $34 million for extensions in Missouri.

ST. LOUIS—Fulton Mower & Mfg. Co., 2436 North Grand boulevard, has bought site on highways 140 and 99 for postwar expansion.

ARKANSAS

HAZEN, ARK.—Arkansas Power & Light Co., Simmons National building, Pine Bluff, Ark., plans an electric power substation here, costing about $75,000.

OKLAHOMA

GUYMON, OKLA.—Cabot Carbon Co. of Massachusetts, with local offices, plans a carbon black plant to be financed by Defense Plant Corp., estimated to cost $1,500,000.

WISCONSIN

GREEN BAY, WIS.—Firestone Tire & Rubber Co., Green Bay, has let contract to W. Van Ess, 1100 Velp avenue, for a one-story 40 x 150-foot tire recapping plant. R. W. Surplice, City Center building, is architect.

MANITOWOC, WIS.—Heresite & Chemical Co., manufacturer of cast resins, coatings, etc., has let contract to Kasper Construction Co. for a plant addition.

RACINE, WIS.—Haas Foundry Co. plans to rebuild its foundry, destroyed by fire Dec. 15.

MINNESOTA

MINNEAPOLIS—Lewis Bolt & Nut Co., 504 Malcolm avenue Southeast, has let contract to Victor Carlson & Sons Inc. for a 1½-story forge shop 80 x 150 feet to replace shop recently burned. Toltz, King & Day Inc., Pioneer building, St. Paul, are architects and engineers.

MINNEAPOLIS—Accurate Tool & Gage Co., 2903 Lyndale avenue South and 350- Hennepin avenue, will remodel building at 47 South Twelfth street into a machine shop to provide additional facilities.

NORTH ST. PAUL, MINN.—Dobbins Mfg. Co., manufacturer of metalware, has let contract to Lawrence Peterson Construction Co., St. Paul, for a second-story addition to its plant.

TEXAS

DALLAS, TEX.—Pratt Paint & Varnish Co., 426 Factory street, plans a two-story plant to cost about $40,000. George Dahl, Insurance Building annex, is architect.

HOUSTON, TEX.—G. Reddock, 1817 Forrest Hill street, will let contract soon for a one-story 80 x 110-foot mechanical shop to cost about $40,000.

HOUSTON, TEX.—Shell Oil Co. Inc., Shell building, has let contract to Foster Wheeler Corp., Shell building, C. F. Braun & Co., 1000 South Fremont avenue, Alhambra, Calif., and Fluor Corp. Ltd., 2500 Atlantic boulevard, Los Angeles, for a fluid catalytic high-octane gasoline refining plant, auxiliary gas plant for recovery of hydrocarbons, additional water-cooling towers, installing gas lines and additions to water plant at Deer Park. Cost is estimated at $11,285,000.

LOCKHART, TEX.—City, Sam H. Tabor, mayor, plans sewage disposal system costing about $100,000. Julian Montgomery, Littlefield building, Austin, Tex., is engineer.

SAN MARCOS, TEX.—City, Earl C. McGee, mayor, is having plans made for a sewage disposal plant to cost $150,000, for postwar construction. Julian Montgomery, Littlefield building, Austin, Tex., is engineer.

IOWA

CEDAR FALLS, IOWA—Bolser Corp., manufacturer of highway flares, reflectors and other truck safety devices, has bought a three-story building 60 x 150 feet, which will be remodeled into a modern factory.

VILLISCA, IOWA—City, C. M. Orr, mayor, is having survey made for extension of the sewer system and a sewage disposal plant, to cost about $30,000. Stanley Engineering Co., Muscatine, Iowa, is engineer.

WASHINGTON, IOWA—Carris Mfg. Co., plans erection of a one-story factory building.

COLORADO

DENVER—Gates Rubber Co., 999 South Broadway, has let contract to F. J. Kirchof Construction Co., 700 Lawrence street, for a four-story plant 175 x 185 feet, to cost about $500,000.

CALIFORNIA

EL SEGUNDO, CALIF.—Standard Oil Co. of California, El Segundo plant, has let contract to McNeil Construction Co., 5860 Avalon boulevard, Los Angeles, for a one-story 75 x 154-foot and 43 x 44-foot cafeteria building, to cost about $200,000. Austin Co., 777 East Washington boulevard, Los Angeles, is architect.

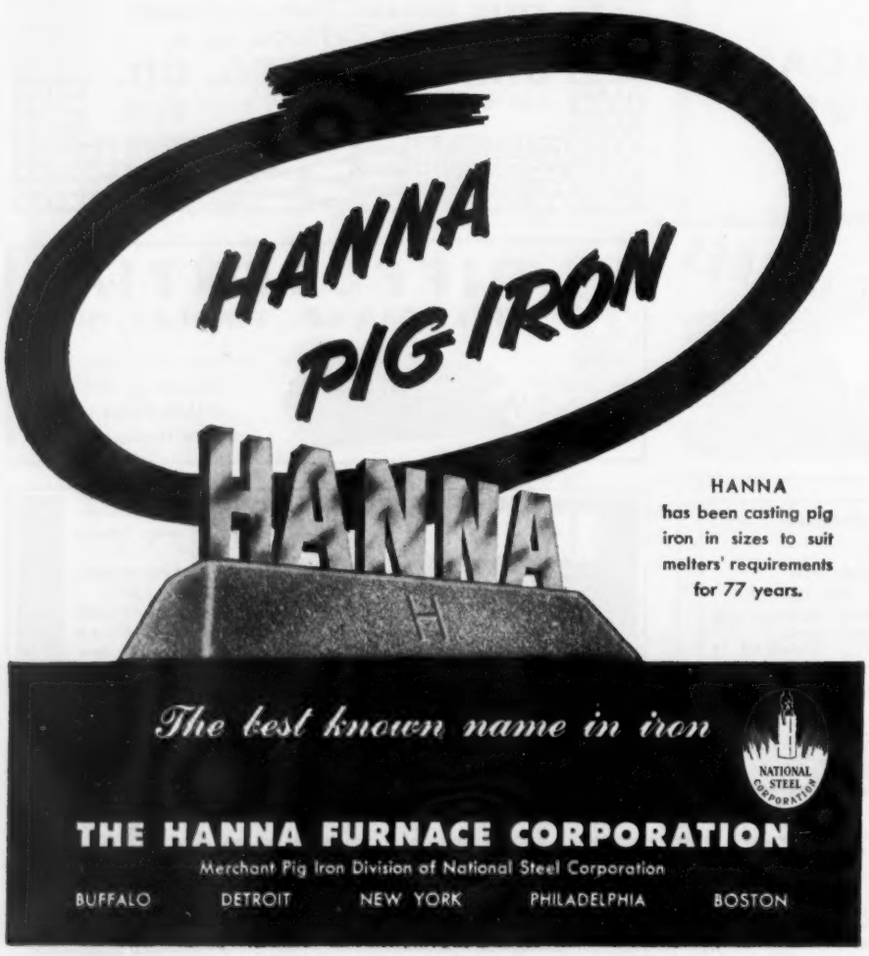
LOS ANGELES — Western Electro-Chemical Co., 2650 East Washington boulevard, has let contract to Bechtel McCone Corp., 601 West Fifth street, for a 90 x 100-foot chemical plant costing about $53,000. R. W. Phelps, 601 West Fifth street, is engineer.

LOS ANGELES—Percival Steel & Supply Co., 4600 South Santa Fe avenue, plans to apply for WPB priority for an addition to warehouse facilities totaling about 25,000 square feet, at estimated cost of about $85,000. Plans are in preliminary stage.

OREGON

INDEPENDENCE, OREG.—City, City Hall, plans construction of a sewage disposal plant to cost over $25,000.

REDMOND, OREG.—City, City Hall, is having plans made for a water treatment plant to cost $40,000. R. H. Corey, Corbett building, Portland, Oreg., is engineer.



DPC Authorizes Plant Expansion, Equipment

Defense Plant Corp. has authorized the following expansions and equipment purchases (figures are approximate):

William M. Fencil Co., Chicago, $90,000, to provide equipment at a plant at Huntley, Ill.

Brewer Mfg. Co., Muncy, Pa., $60,000 to provide equipment at a plant at Williamsport, Pa.

Bellanca Aircraft Corp., New Castle, Del., to provide additional equipment at a plant in Delaware, $50,000 increase in contract, making overall commitment $300,000.

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Technical background, industrial machinery manufacturer. Metropolitan New York Area. Submit complete resume and non-returnable photo. Box 915, Equity, 113 W. 42nd St., New York City. WMC rules observed.

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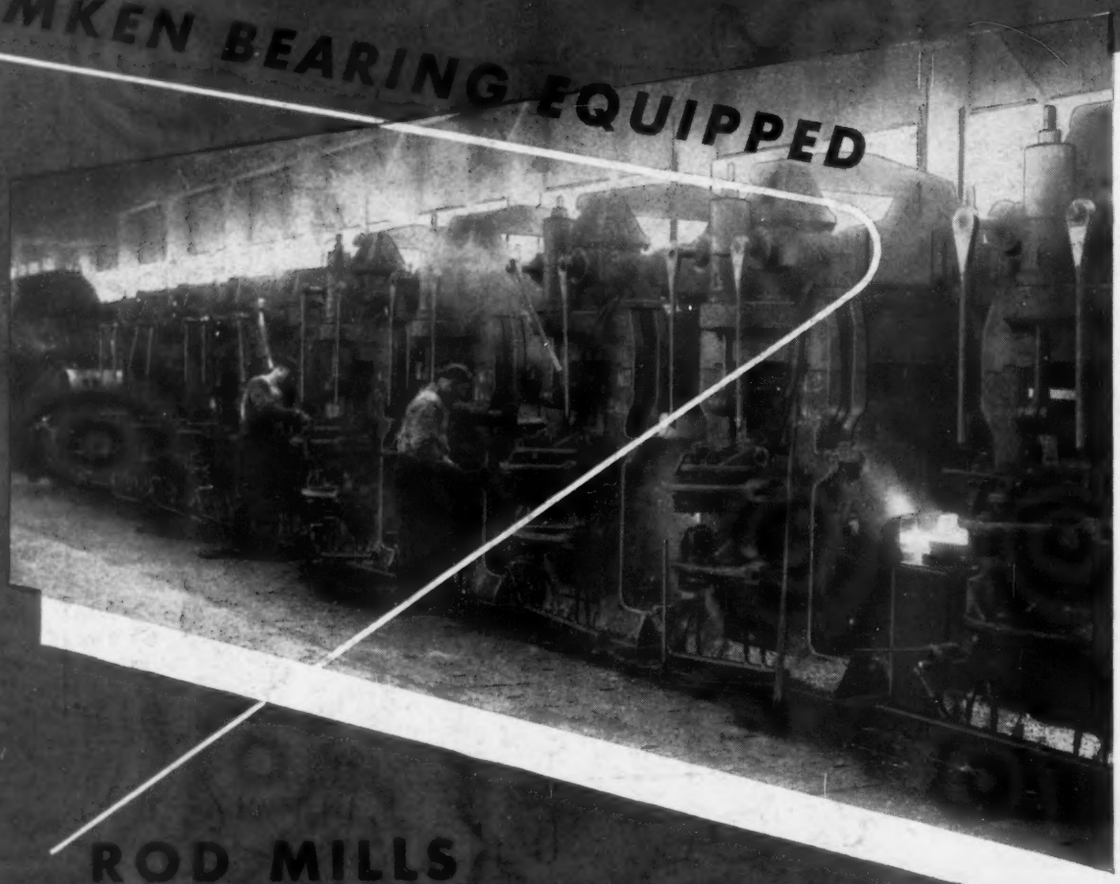

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